SEPTEMBER, 1948

COPY SENT TO L. C.

PIPE LINE INDUSTRY

© Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

MAINTENANCE ISSUE

A roundup of pipe line maintenance ideas that will save you time and money . . .

Turn page for additional contents and a Quick Review of this issue

SUPER-INCH LINE

How Pacific Gas & Electric Company proposes to limit downtime to 12 hours in event of failure. Page 26

CRANKSHAFTS

How Texas-Illinois replaced four crankshafts which broke in rapid succession. Page 32

ENGINES AND COMPRESSORS

Maintenance 'musts' save time, money, and improve operations. Page 37

DIESEL ENGINES

How Service Pipe Line Company uses 'health' charts to improve performance. Page 40

MAINTENANCE HINTS

Transcontinental's exchange of ideas between stations is paying off. Page 44

POWER PUMPS

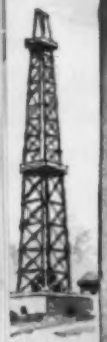
Here's what to look for if a pump doesn't deliver the proper capacity. Page 51

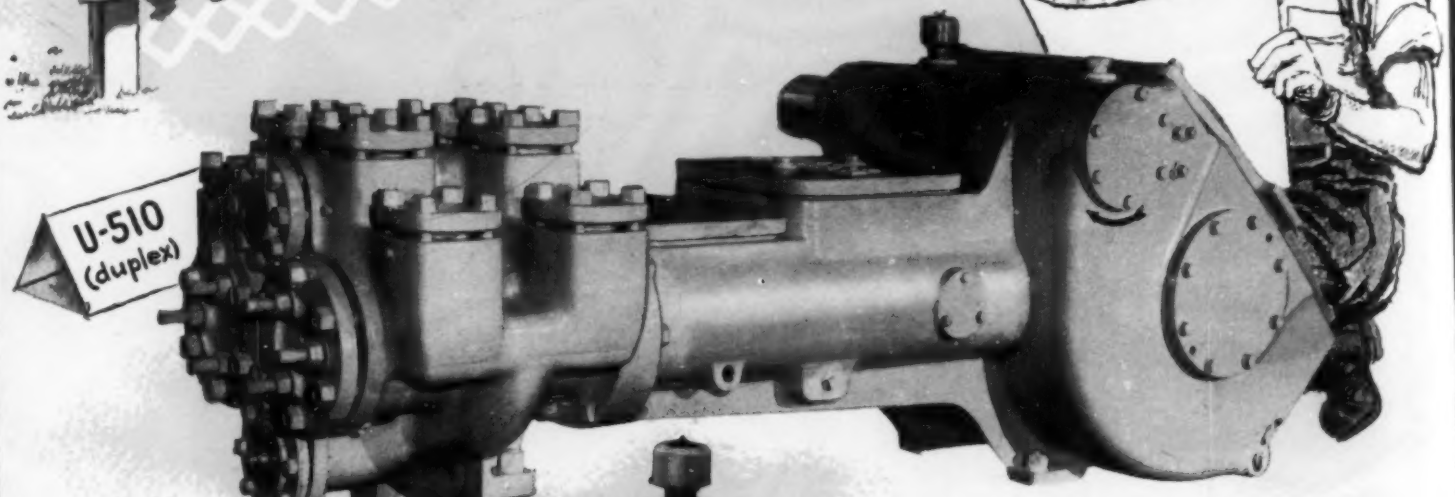
Subscription price $2 per year

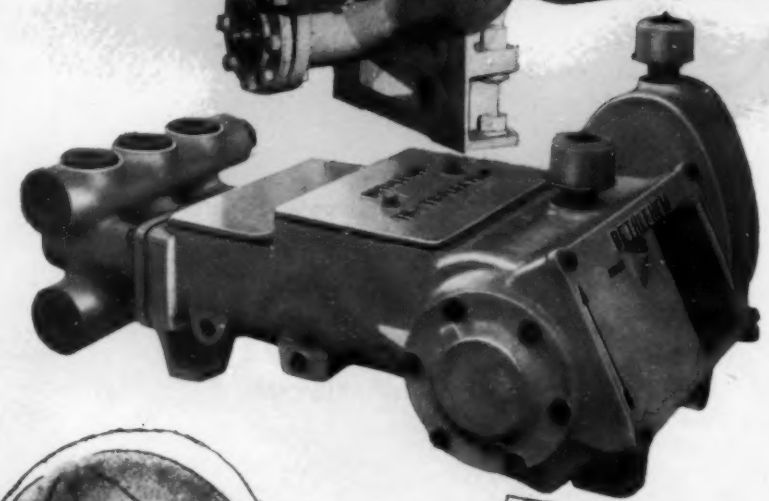
Single copy price 50 cents

Bethlehem Power Pumps for General Service

BETHLEHEM STEEL







TP-3
(triplex)

Whenever you need a pump for gathering or pipe-line work, general service around a rig or lease, salt-water handling or disposal, refinery or terminal service, Bethlehem can meet your requirements. From Bethlehem's expanded line of duplex and triplex power pumps, you can select exactly the right unit to handle the fluid you wish to move.

Outstanding features of these general-service pumps include:

- Positive lubrication throughout the power end over the full speed range.
- An adequate choice of fluid ends, with the proper trim for each selection.
- Rugged power ends of high-strength alloy iron to withstand the full-load rating of the pump under 24-hour service.
- Adaptability of the entire line to speed-changer drive applications.

For further information, we suggest you phone or write our nearest office. We will be glad to supply complete details, and to recommend precisely the proper pump for the kind of job you have in mind.

The pumps are available in the following sizes and types:

Model	Type	Input Hp	Bore & Stroke
U-33	Duplex	8	1¾ to 3 x 3
TP-3	Triplex	18	1¾ to 2¼ x 3
U-46	Duplex	24	2½ to 4 x 6
U-510	Duplex	100	3 to 5½ x 10

BETHLEHEM SUPPLY COMPANY

General Offices: 21 E. Second St., Tulsa, Okla.
West Coast Headquarters: Los Angeles, Calif.

Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

BETHLEHEM SUPPLY

SEP 12 1955 B 552908

PIPE LINE INDUSTRY

CONTENTS and Quick Review

September, 1955 Vol. 3, No. 3

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

This ABC insignia is a mark of quality in the publishing field. PIPE LINE INDUSTRY is proud to exhibit it. PLI has become a full-fledged member of ABC (Audit Bureau of Circulations) in less than a year . . . something of a record.

But PLI was destined to break records because its editorial policies were planned and conceived with the help of you men in the industry.

Primarily the ABC mark shows that our readers are "paid" subscribers. But it holds a greater meaning to you. Since you pay to read PLI, the editors have a responsibility to make it worthy of your investment.

PLI's tremendous growth shows it to be the No. 1 choice of pipe line men. The staff is pledged to see that it continues to merit your interest.

DEPARTMENTS

Editorial Page 4
Who's Meeting Where 24
Rules of Thumb 71
Pipe Line Hints 72
Construction News 76
Personals 96
Suppliers' Notes 102
What's New in Equipment 114
New Equipment Catalogs and Literature 123
ADVERTISER'S INDEX 124

Super-Inch Failure: Limit Downtime to 12 Hours

☐ Cutting the downtime in half in event of failure was the goal of Pacific Gas and Electric Company when they began a study of its emergency repair setup. This article tells how they accomplished it.

By E. Howard Fisher ..... Page 26

How to Replace Crankshafts

☐ When four 28-foot engine crankshafts weighing 6.3 tons each broke in rapid succession, Texas Illinois Natural Gas Pipeline Company had to replace them in short order. Just how they went about it is worth knowing ..... Page 32

Maintenance Musts for Engines and Compressors

☐ Properly maintained engines and compressors mean higher efficiency and lower production costs. Application of these "musts" will do the job.

By V. E. Ford ..... Page 37

'Health' Charts Aid Diesel Engine Maintenance

☐ Continuous graphic records of engine operating conditions have helped Service Pipe Line Company reduce downtime and improve maintenance schedule and engine performance.

By Carl I. Huss ..... Page 40

Transco's Remarkable Station 13

☐ Transcontinental Gas Pipe Line Corporation's Compressor department has fostered the exchange of ideas between stations. Here are many of the ideas that have been put into effect.

By Donald M. Taylor ..... Page 44

Maintaining Pipe Line Power Pumps

☐ Here's what to look for when a pump doesn't deliver proper capacity or pressure.

R. K. Grobholz ..... Page 51

Vapor-Phase Engine Cooling

☐ Like most innovations, vapor-phase engine cooling has many problems that must be worked out. Here's how United Gas Pipe Line Company went about it.

By C. D. Long ..... Page 56

Troubleshooting Displacement Meters

☐ Here are some trouble-shooting procedures that will reduce wear and friction and eliminate damage to diaphragms . . . meaning better performance by displacement meters.

By Ed R. Gilmore ..... Page 66

PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Product Dispatchers Organize

The need for exchanging information on an industry-wide basis for the purpose of working out the answers to many problems has made trade associations and societies an important factor in today's business world. This is especially true of the petroleum industry. Because of the exceptionally wide variety of problems encountered in various branches, many fine oil associations exist. Some function for the over-all industry, while others devote themselves to specialized fields.

One of the newest highly specialized organizations is called the "Products Control and Dispatching Group." It has been formed for the purpose of studying mutual problems relating to the scheduling, dispatching and controlling of refined products transported through pipe lines.

•

With its limited scope, this group will never become a big association. However, this in no way will detract from the service it can perform for those engaged in the operation of product pipe lines. Quite the contrary. Because of full devotion to the particular problems of this specialized operation, it can better serve this field.

Actually the association desires to remain small, so that open discussions will result in the free exchange of ideas and information. Participation is limited to qualified personnel. Membership is open to only one representative of each company or department. Companies may not send more than two additional non-members to annual meetings.

Furthermore, the group desires that conferees be thoroughly experienced in product pipe line operations, or be specialists skilled in product movement, such as chief dispatchers, supervisors of product movement, chief gagers, chemists and professional engineers.

The group was formed in 1949 by three companies: Standard Oil Company (Indiana); Great Lakes Pipe Line Company; and Wyco Pipe Line Company. Since that time it has expanded gradually. Last year it was decided to open membership to all in the business of transporting refined petroleum products by pipe lines. Forty-five conferees representing 18 product pipe line companies in the U. S. and Canada attended the 1954 annual meeting.

The 1955 two-day annual meeting will be held at the Lennox Hotel in St. Louis, Mo., on September 22 and 23. About 50 representatives of 27 companies are expected to attend.

Anyone interested should contact W. J. Curry, Secretary. His address is Shell Oil Company, Products Pipe Line Department, 50 West 50th Street, New York 20.

•

The first petroleum product pipe lines of any real importance came into existence more than 20 years ago. While recent years have witnessed the construction of an increased number of product lines, they remain a relatively small segment of the over-all oil and gas pipe line business. The future is expected to see future growth on a larger scale, indicating that the transportation of petroleum products by pipe lines is to become a more important segment of the industry.

Even at this moment, however, the peculiar problems of moving different types of petroleum products through a pipe line are of major interest to those engaged in the business. Hence, this new association is catering to the interest of a small but vital group of the industry.

Warren L. Baker

Were you shortchanged last month?

● Like getting your windshield cleaned when buying gasoline from a first-class service station operator . . . you naturally expect prompt and understanding service when ordering maintenance supplies for a modern pipe line system . . . and you feel "short-changed" if you don't get it.

"Oilwell" representatives in pipe line equipment sales, fully understand your material problems and know what is needed to keep pumping stations in operation. The practical experience which they have had in the application and use of pipe line supplies qualifies them as "specialists" in this work—not mere "catalog" men.

Read this imposing list of services that assure you of full value with every order from "Oilwell."

Complete warehouse system—Well-stocked warehouses are conveniently located to serve the important pipe line centers. Inquiries are given prompt attention and deliveries are made quickly to meet your emergency requirements.

Lower inventory investments—You can cut your own warehouse stocks to a minimum, reduce obsolescence and get a wider selection of materials, sizes and brand names from "Oilwell's" complete inventories.

Experienced personnel—"Oilwell" pipe line specialists have been trained to understand your material and service problems and can give you the service you require.

Quality products—"Oilwell" stocks include the best known brand names in equipment and materials, designed and approved for pipe line operations. When it comes from "Oilwell," you know it will meet your specifications.

92 years of experience—From almost the beginning of the petroleum industry, "Oilwell" has worked with the men engaged in drilling and production. Our goal is to extend the same prompt, dependable and complete service to those responsible for Pipe Line operations.

These famous products are sold by "Oilwell"

Bridgeport Brass	Taylor-Forge
Catawissa	Thermoid
Johns-Manville	Vogt
Lunkenheimer	Walworth
Manning, Maxwell & Moore	Watson-Stillman
National Tube	Wilson-Snyder
	Worcester

and many others

OIL WELL SUPPLY

DIVISION
UNITED STATES STEEL CORPORATION
Executive Offices—DALLAS, TEXAS
with Refinery Warehouses at

Beaumont, Texas
Berger, Texas
Casper, Wyoming
Charleston, W. Virginia
Garland, Texas
Houston, Texas
Los Angeles, California
Odessa, Texas
Ponca City, Oklahoma

USS

Branches Serving All Oil Fields

"OILWELL"

Trade-Mark

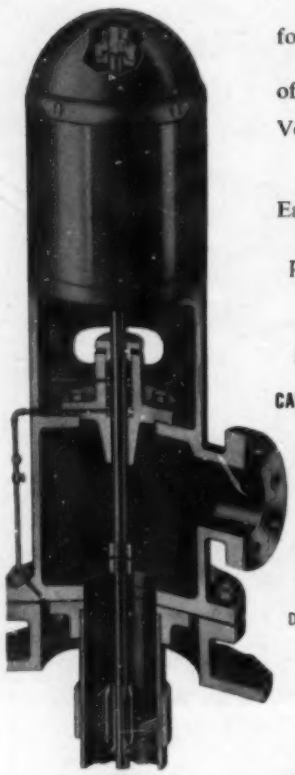
UNITED STATES STEEL

Verti-Line
CLOSE-COUPLED PUMPS
for every Industrial Vertical Pump Installation

The Verti-Line Close-Coupled Pump is not just another deepwell pump adapted to industrial service. It is designed and engineered for such jobs as booster service, fire protection, cooling, transfer and general service pumping of water and other fluids, corrosive or non-corrosive.

Verti-Line Pumps are made to the highest standards of quality in workmanship and materials to assure a *precision built* product. Each unit is thoroughly tested and rigidly inspected, insuring ease of field assembly and perfect performance—guaranteed to meet the most exacting specifications.

Whatever your vertical pump needs, investigate Verti-Line Pumps before you buy.



CAPACITIES FROM 20 GPM TO 30,000 GPM — HEADS TO 600 PSI

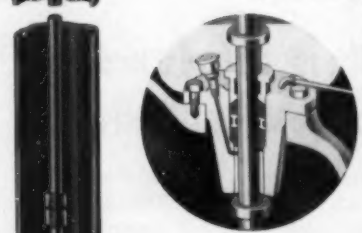
Heavy-Duty Fabricated Discharge Head With Solid Shaft Motor

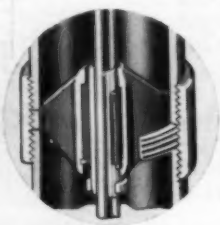
In-Line "T" Type Fabricated Discharge Head With Hollowshaft Motor

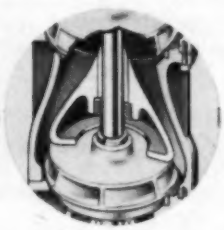
Standard Discharge Head With Combination Gear and Motor Drive

TYPICAL CONSTRUCTION FEATURES

(Open lineshaft type . . . Enclosed lineshaft also available)







The packing assembly is simple and effective. It is easily accessible and consists of a packing container, lantern ring, packing rings, pressure relief bushing, gland, fluid by-pass and lubrication fittings. Mechanical shaft seals also available.

Outstanding feature of bearing assembly is removable stainless steel shaft sleeve. This prevents shaft wear and bearing journal corrosion, and is easily replaced without special tools. You simply remove the old and slip on the new which is secured by a stainless steel collet.

Dual bowl bearings of rubber and bronze are supplied in most open and enclosed lineshaft pumps. Extra stability and resistance to abrasives mean longer life.

Send for your free copy of our new booklet, "Pumps for Sale." Ask for Bulletin P-95

Verti-Line Pumps are the exclusive products of

LAYNE & BOWLER PUMP COMPANY

general offices and main plant

2943 VAIL AVENUE • LOS ANGELES 22, CALIFORNIA

PIPE LINE INDUSTRY

Specialized oil publications of THE GULF PUBLISHING COMPANY, 3301 Buffalo Drive, Houston 6, Texas; Box 2608, Houston 1, Texas. Cable Address: GULFPUBCO.

PIPE LINE INDUSTRY for the oil and gas pipe line industry.

WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.

PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

•

RAY L. DUDLEY, President, Publisher

A. L. BURNS, Vice President, General Manager

•

EDITORIAL STAFF

Warren L. Baker, Editorial Director; Donald M. Taylor, Editor; Al Reese, Managing Editor; Melvin A. Judah, Cecil W. Smith, Don Kliewer, Wallace Fitzgerald, William G. Dudley, Joseph Hopkins, Associate Editors.

District Editors: Harrison T. Brundage, 250 Park Ave., New York 17; Gilbert M. Wilson, W. W. Wilson Building, Huntington Park, Calif., and Anthony Gibbon, Hunt Building, Tulsa 3, Okla.

Editorial Assistant: Joan Frandolig.

Librarian: Eunice Okoneski.

•

CIRCULATION DEPARTMENT

R. M. de Sombre, Manager.

ABC

ADVERTISING STAFF

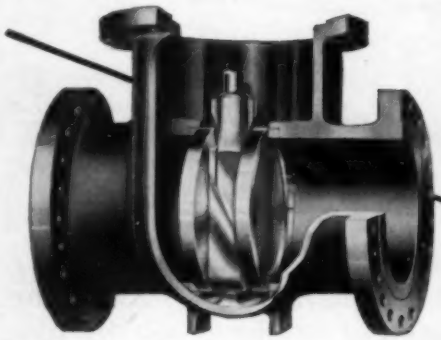
Tom W. Nelson, Advertising Manager; D. S. Craig, Advertising Service Manager. *Representatives:* NEW YORK (17): Gene Hart, George Skelton, Nelson Bigelow, 250 Park Ave., Phone El Dorado 5-4012; CLEVELAND (15): Bill Westfall, 1010 Euclid Ave., Phone MAin 1-2550; CHICAGO (4): H. G. Fitzpatrick, Martin Halloran, 332 So. Michigan Ave., Phone Wabash 2-9330; LOS ANGELES: Jay Curts, W. W. Wilson Bldg., Huntington Park, Phone Ludlow 7-1219; TULSA (3): Jim Isaacks, Hunt Bldg., Phone 3-1844; HOUSTON (6): Charles Wyatt, William G. Dudley, 3301 Buffalo Drive, Phone JAckson 9-4301; EUROPEAN: Theodor Miocha, Limmerstrasse 31, Hannover, Germany, Phone 4-2935; UNITED KINGDOM: Frank Chambers, 120 Moorgate, London, E.C. 2, Phone Monarch 5661.

•

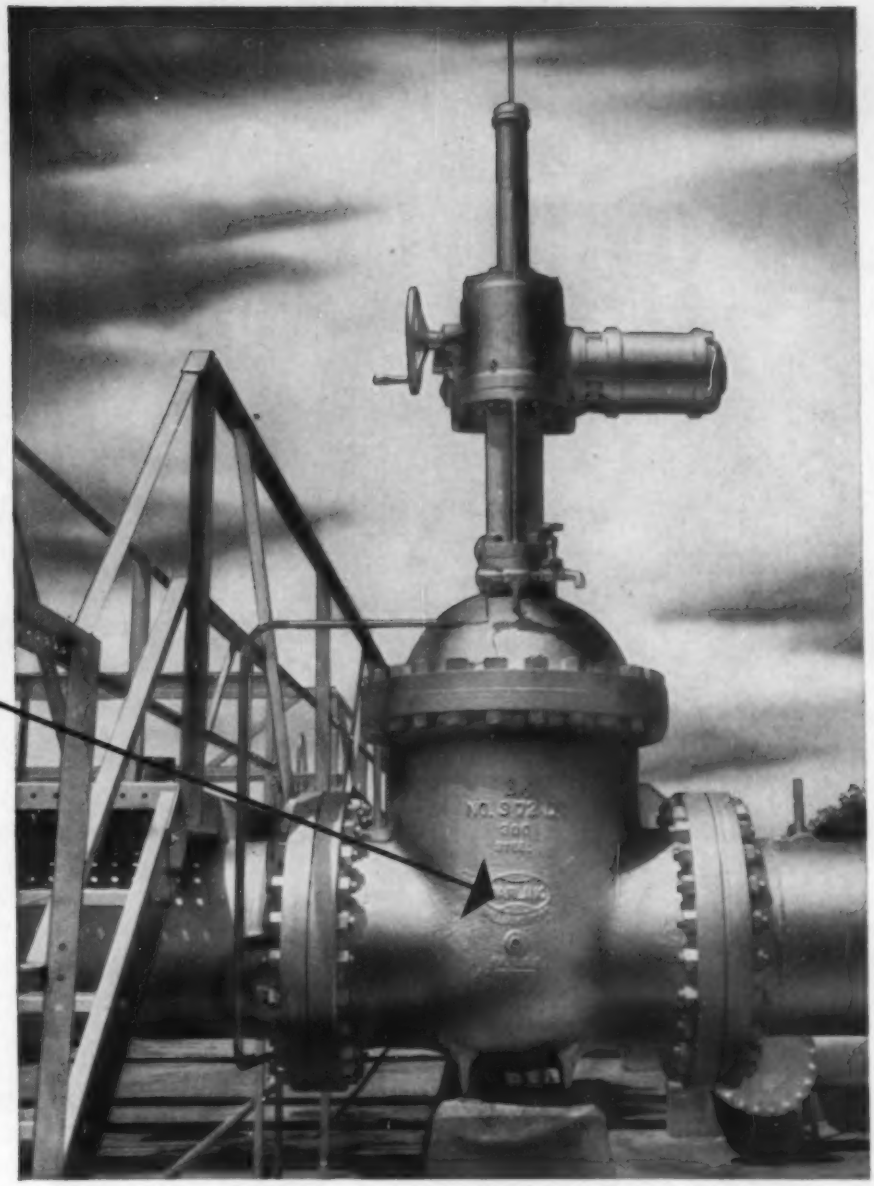
Single copies 50 cents (except special issues). Double price for single copies more than a year old. Subscription price: domestic and foreign $2 a year; 2 years, $3; 3 years, $4. Subscription restricted to those engaged in the pipe line branch of the oil and gas industry, or the manufacturing and distribution of pipe line equipment.

Advertising rates on application. Copyright, 1955, by The Gulf Publishing Company.

LOOK INSIDE



for dollars to be saved!



Darling 24", Series 300, motor-operated gate valve, with fully revolving double disc feature, at pipe line terminal of oil pumping station.

SURE! Other things being equal, it's definitely the inside of a gate valve that really tells the story. That's why we show and stress the importance to you of Darling's *fully revolving double disc, parallel seat principle!*

Simple construction, interchangeable no-pocket discs . . . yes . . . but that's only the start. This principle assures uniform distribution of disc-and-seat wear . . . coupled with Darling's unique wedging feature it once and for all licks the problem of faulty closure due to valve body distortion . . . and greatly eases operation even under the most adverse conditions.

That's why oil and gas men everywhere have come to count on Darling gate valves for surer performance, longer life and less down time. It pays. We'll gladly give you *all* the facts on Darling valves for your particular operations. Just ask.

DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

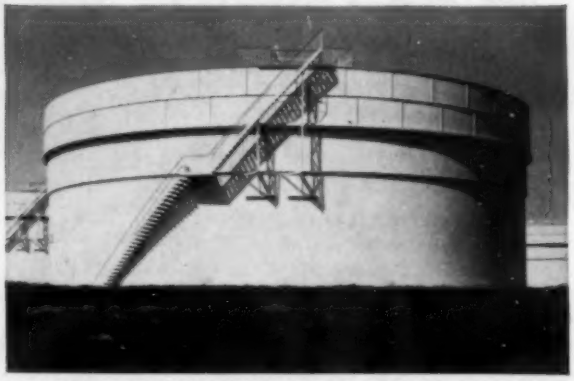
Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

guard 'gainst evaporation losses

with GRAVER

Expansion Roof Tank

It is now generally recognized that the Graver Expansion Roof Tank has no peer for protecting volatile liquids from evaporation loss. One such tank often protects an entire terminal. It is easy to manifold to cone roof tankage. The positive liquid seal protects under all conditions. You eliminate breathing losses and minimize filling loss with the Graver Expansion Roof Tank.



GRAVER EXPANSION ROOF TANKS give long, trouble-free service. After 16 years, the first tanks of this design are still operating effectively—and with only normal attention and maintenance.

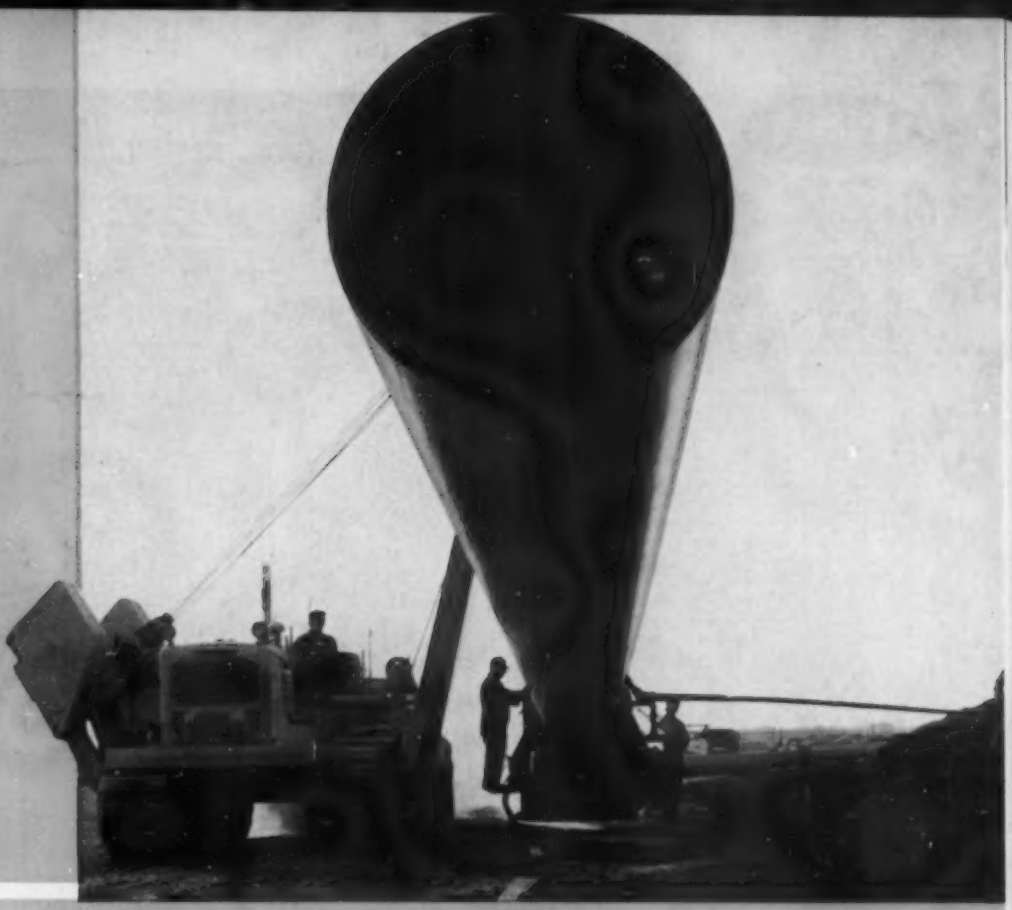
GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

CHICAGO • NEW YORK • PHILADELPHIA • EDGE MOOR, DEL. • CATASAUQUA, PA. • PITTSBURGH • CLEVELAND • DETROIT • TULSA • SAND SPRINGS, OKLA. • HOUSTON • ODESSA, TEXAS • CASPER, WYO. • LOS ANGELES FONTANA, CAL. • SAN FRANCISCO

GRAVER ...CONSERVATION TANKAGE FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

THE BIG GUN IN PIPELAYERS!



...The CAT* No. 583 Pipelayer!

NEW LIFTING CAPACITY OF 130,000 POUNDS

NEW HIGH 21-INCH CLEARANCE

NEW IMPROVED STABILITY

NEW THREE-STAGE TORQUE CONVERTER IN MAIN DRIVE

NEW HYDRAULICALLY ACTUATED COUNTERWEIGHTS

NEW HEAVY-DUTY CONSTANT-MESH PIPELAYER WINCH TRANSMISSION

NEW LIVE-SHAFT, CONSTANT-POWER DRIVE

For the first time you get a pipelayer that's *all pipelayer*—not a tractor attachment. It's Caterpillar's all-new No. 583.

Check the features listed above. They are answers to many of your problems because you helped design them. Caterpillar engineers worked closely with you of the pipeline industry in developing a unit to lick your own special problems.

The result was the No. 583 Pipelayer—*the complete pipelayer*. It's the most efficient, highest capacity pipelayer in history. No details have been overlooked. For instance, the drive of the pipelayer winch transmission is independent of the master clutch and torque converter. That means the rear of the No. 583 is left clear for winch or other rear-mounted equipment.

Boom and load line brake levers have handles easily distinguished by feel. Operators can use them and still watch the job for maximum safety. And the unit is powered by a 191-HP Caterpillar Diesel Engine, which includes a new block, a new fuel injection system, and a more efficient cooling system!

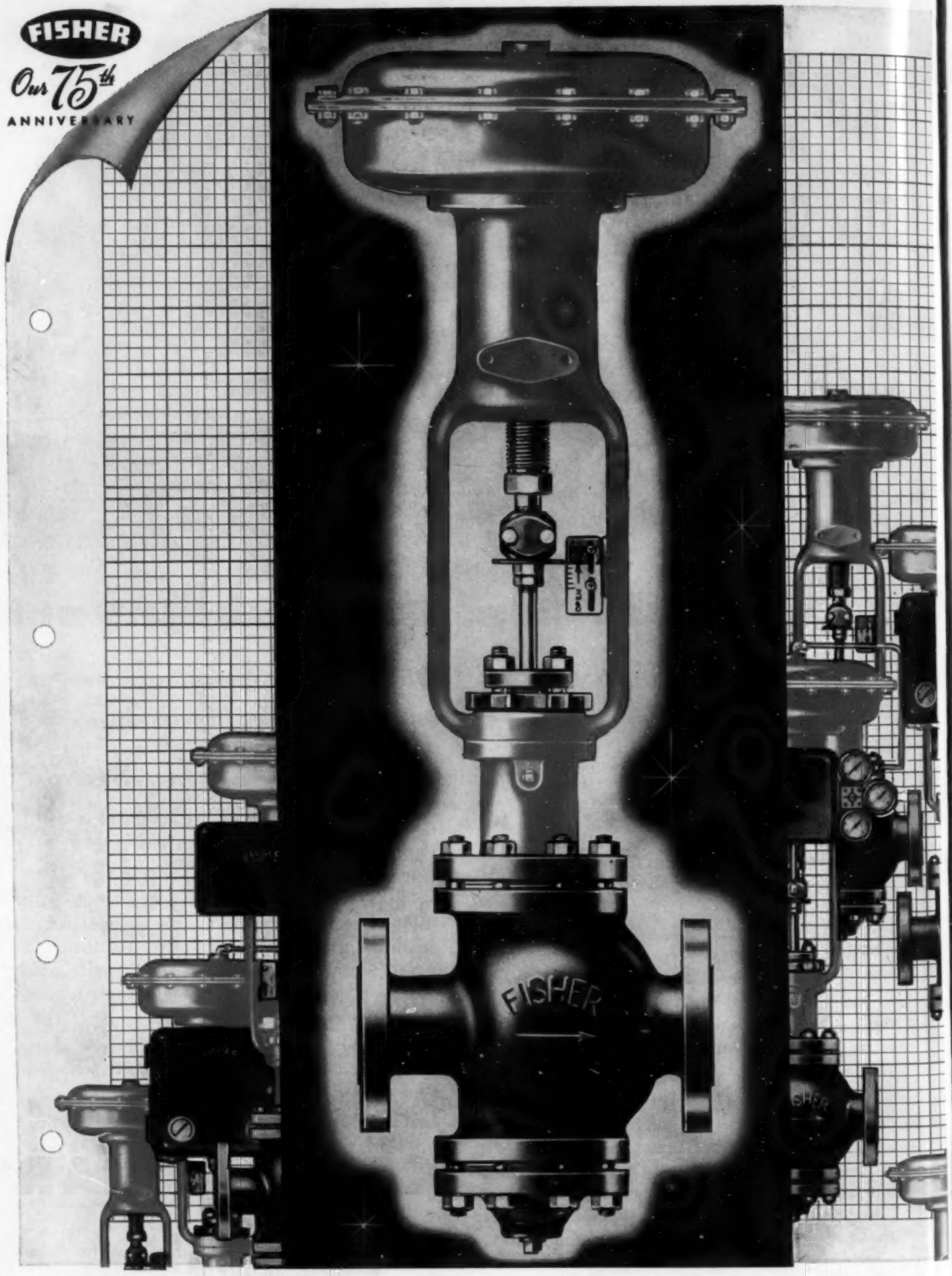
See your Caterpillar Dealer for additional reasons why the No. 583 can help you realize more profit from your pipeline jobs.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Cat and Caterpillar are Registered Trademarks of Caterpillar Tractor Co., U. S. A.

CATERPILLAR LEADERSHIP IN ACTION


FISHER
Our 75th
ANNIVERSARY
FISHER

FISHER®

Presents An Improved

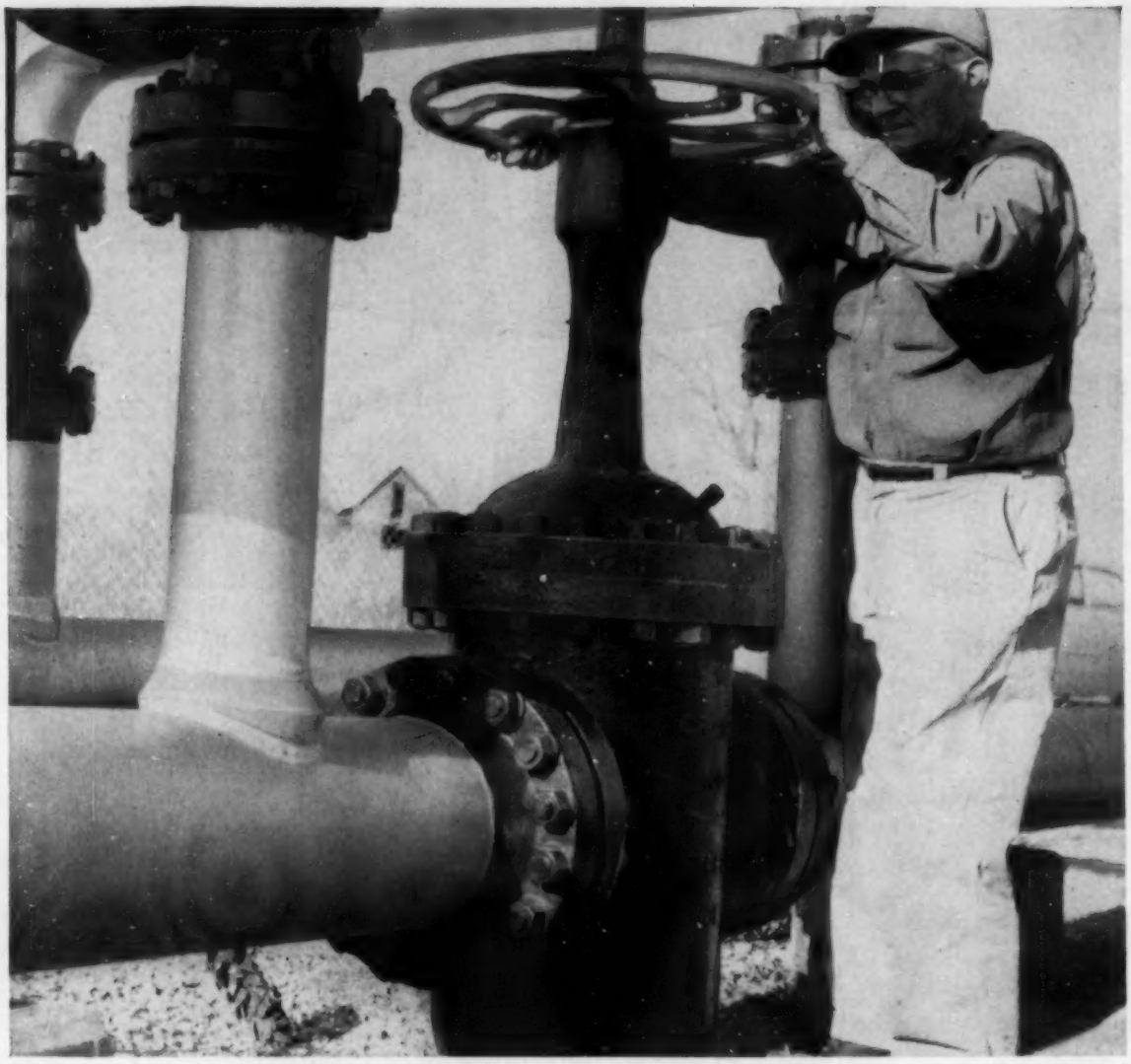
DIAPHRAGM MOTOR VALVE OPERATOR

Bolted-clamp type stem connection. This allows large latitude in valve stroke adjustment. It can be disconnected in the field without damage to the stem. It will not shake loose from vibration or rotational inner valve forces.

• Rugged body to yoke connection with hammer lug nut. • Deep drawn steel diaphragm castings. • Specially designed molded diaphragms. • Bolted gland stuffing box with Teflon packing. • Improved clear view travel indicator. • Spring ranges: 3 to 15 psi; 3 to 27 psi; 6 to 30 psi.

FISHER GOVERNOR COMPANY • Marshalltown, Iowa

WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL



Easy does it...year after year with this Crane pipe-line valve

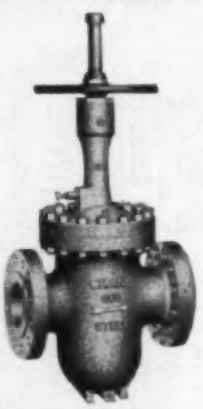
THE CASE HISTORY—More than 3 years ago the Phillips Pipe Line Co. installed this Crane conduit valve in a junction manifold on its 10-inch crude line to Borger, from Yale Station, Oklahoma. How's it doing?

Operated every day or two until a few months ago, this Crane double-seating, grease-packed valve has always responded smoothly and easily to the handwheel—never sticking. Under former frequent usage as now with infrequent operation, it has never leaked at the bonnet joint or packing chamber—remains tight as new at the seats. This Crane valve—because its pressurized stuffing box eliminates leakage—is clean, unstained.

On gas and oil, these Crane valves are making big savings in operating costs. They're the leading value for pipe line service, and thrifty buyers know it. Crane Co., General Offices, Chicago 5, Illinois. Branches and Wholesalers in all industrial areas.

CLASS 600 STEEL PIPE-LINE GATE VALVES

Grease packing in body and bonnet assures thorough internal lubrication for easy operation. Parallel disc design gives tight closure; eliminates seat leakage. Spring plates in contact with disc faces keep foreign matter out of body. When open, conduit ports through disc give straight-line, unrestricted flow. Full-way or Venturi patterns; sizes 2 to 30 in. Literature sent by mail, or ask your Crane Representative.

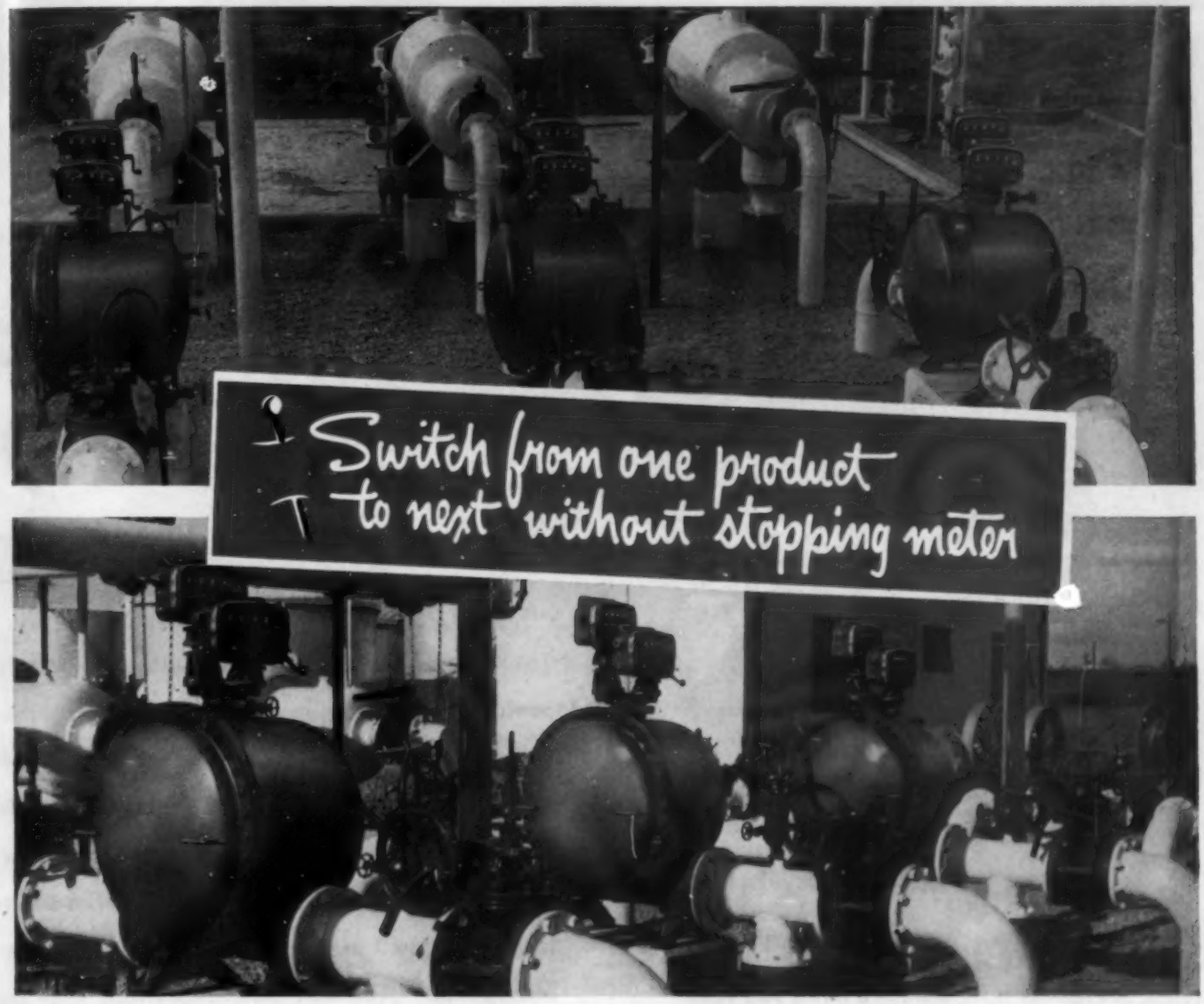


CRANE CO.

VALVES • FITTINGS • PIPE
KITCHENS • PLUMBING • HEATING

CRANE'S FIRST CENTURY...1855-1955

RECORD each run of product separately and accurately—with BRODIE *BiRotor* METERS



- Brodie BiRotor Pipeline Meters handle a continuous and successive flow of products through a single meter, recording each run of product separately and accurately.
- Quick, easy switch-over from one product to the next is accomplished without stopping meter, by means of dual counter arrangement.
- Positive direct reading totals are recorded on meter printed receipts.
- For long dependable service life with high sustained accuracy and low maintenance, consult your Brodie Meter Specialist for full details.

BRODIE ALL-STEEL BiRotor TRUE-ROTARY **METERS**

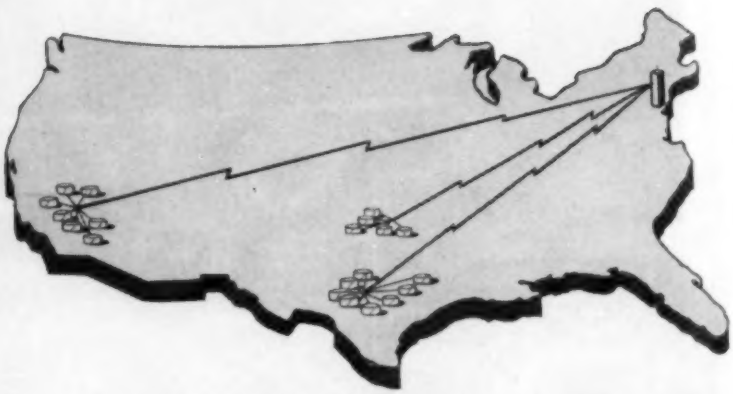
RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.

MT. VERNON, N. Y.	DALLAS 2, TEXAS	CHICAGO OFFICE:	SEATTLE 9, WASH.	LOS ANGELES 22, CALIF.
550 So. Columbus Ave.	167 Parkhouse St.	1227 Circle Ave., Forest Park, Ill.	221 9th Ave. N.	5401 E. Sheila Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

For more data on advertised products, use Readers' Service Cards, last page.

YOU SELECT THE TANK —



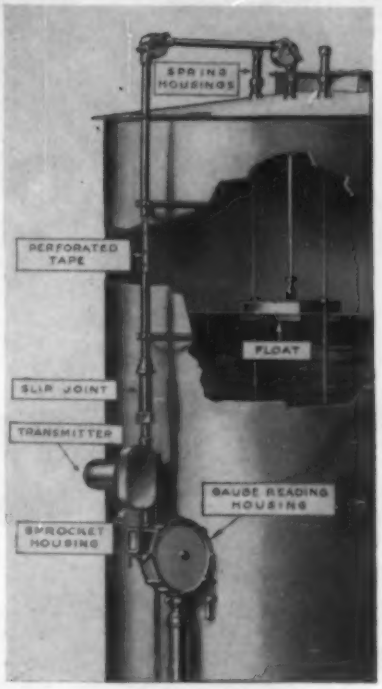
THE versatile Shand & Jurs TELEPULSE system quickly and accurately gages liquid level of any tank within the range of modern communications systems. No matter how distant a tank, S&J TELEPULSE will give you its liquid level in half a minute. TELEPULSE performs remote gaging electrically, automatically and safely; gives you reliable, timely information quickly; eliminates transmittal errors and hazards to personnel; and saves on gaging costs. TELEPULSE is an investment that could pay you large dividends.

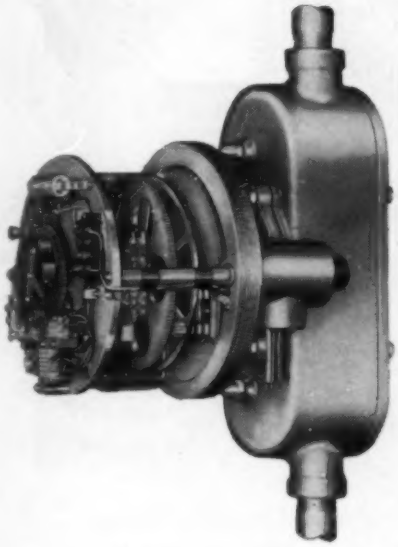
The S&J TELEPULSE system is neither delicately intricate nor over costly. Incorporating time-tested, standard equipment of both the telegraph and dial telephone, TELEPULSE is exceptionally versatile for installation with existing leased wire, radio, or micro-wave communications systems. With dual use in view, a new system combining TELEPULSE and communications may be installed without the least complication. TELEPULSE is versatile for installation, dependable and precise in operation. It will bring you a new concept of remote gaging, never thought possible before.

For complete information about the new S&J TELEPULSE system write the factory or nearest branch listed at the right for Bulletin T-455.

Telepulse will accurately gage its liquid level in 30 seconds!

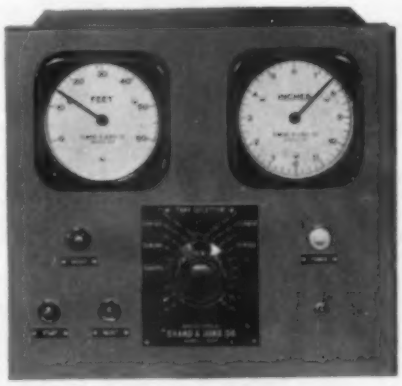
The S&J TELEPULSE system operates in conjunction with time proven S&J Float Gages mounted on each tank for which remote gaging is desired. A typical installation of an S&J Float Gage in the TELEPULSE system is shown at the right. The gage itself has long been a standard and widely used unit for continuous measurement of liquid depths and is accurate to within ⅛" of tank liquid level. Those S&J Float Gages already in operation are easily adapted for incorporation into the new S&J TELEPULSE system.





The transmitter of the S&J TELEPULSE system is installed with its sprocket housing in the gage tape pipe and is coupled directly to the perforated gage tape by a sprocket wheel. As the liquid level in a tank moves up and down, so does the gage float and tape. The tape turns the sprocket wheel which in turn rotates the shaft of the transmitter through proper gearing. Therefore the mechanism in the transmitter corresponds to the liquid level in the tank at all times.

There are at present two principal variations of the S&J TELEPULSE system. Each is adapted to different remote gaging requirements. For long distances, more than 5 to 10 miles, and for large groups or several groups of tanks, the ST-8300 shown at right above is used. For short distances, or local requirements, where spacing and distances are such as to justify direct wire connections to each tank, the ST-8310 system is shown. Either of these systems will deliver the optimum in performance, dependability, and economy, depending on the requirements of a particular remote gaging situation.



Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
342 Madison Ave.

HOUSTON
M & M Bldg.

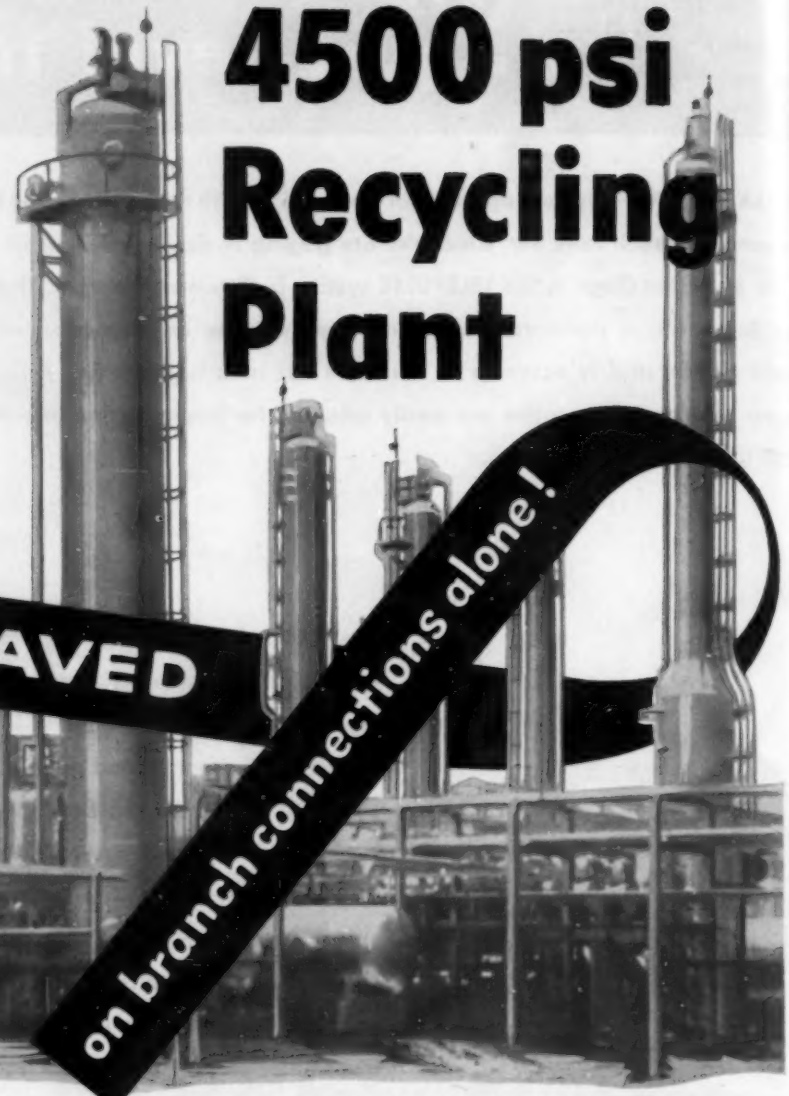
TULSA
Thompson Bldg.

CHICAGO
10409 S. Western Ave.

LOS ANGELES
714 W. Olympic Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St., W
TORONTO: Lytle Engineering Specialties, Ltd., 69 Eglington East
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

4500 psi Recycling Plant

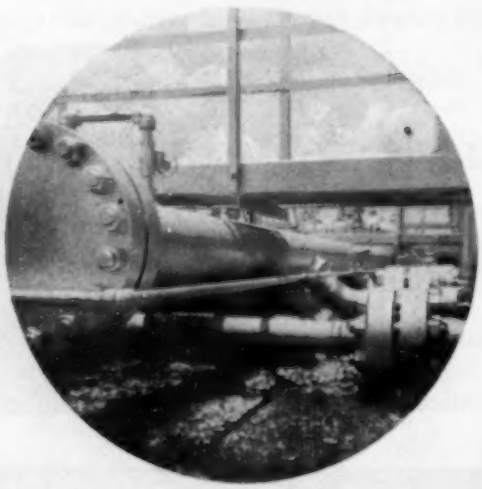


$ 18,000 SAVED

on branch connections alone!

By requesting the alternate use of Weldolet Welding Fittings in all weights and sizes the piping contractor was able to lower his bid sufficiently to be awarded the job!

This recently completed recycling plant in Louisiana was designed and engineered in full accordance with the ASA and ASME Codes and operates at a maximum pressure of 4500 psi and 225°.



The piping engineers on this job were confronted with a number of tough problems. The plant was to be operated at extremely high pressures. The terrain was swampy which meant the fittings had to withstand the additional stresses exerted by a settling foundation. The piping also had to stand up under rugged vibration conditions. The many design features of Weldolet Welding Fittings in both full size and reducing size outlets provided the safe, practical and most economical answer to these knotty service problems.

BONNEY

WELDING FITTINGS DIVISION

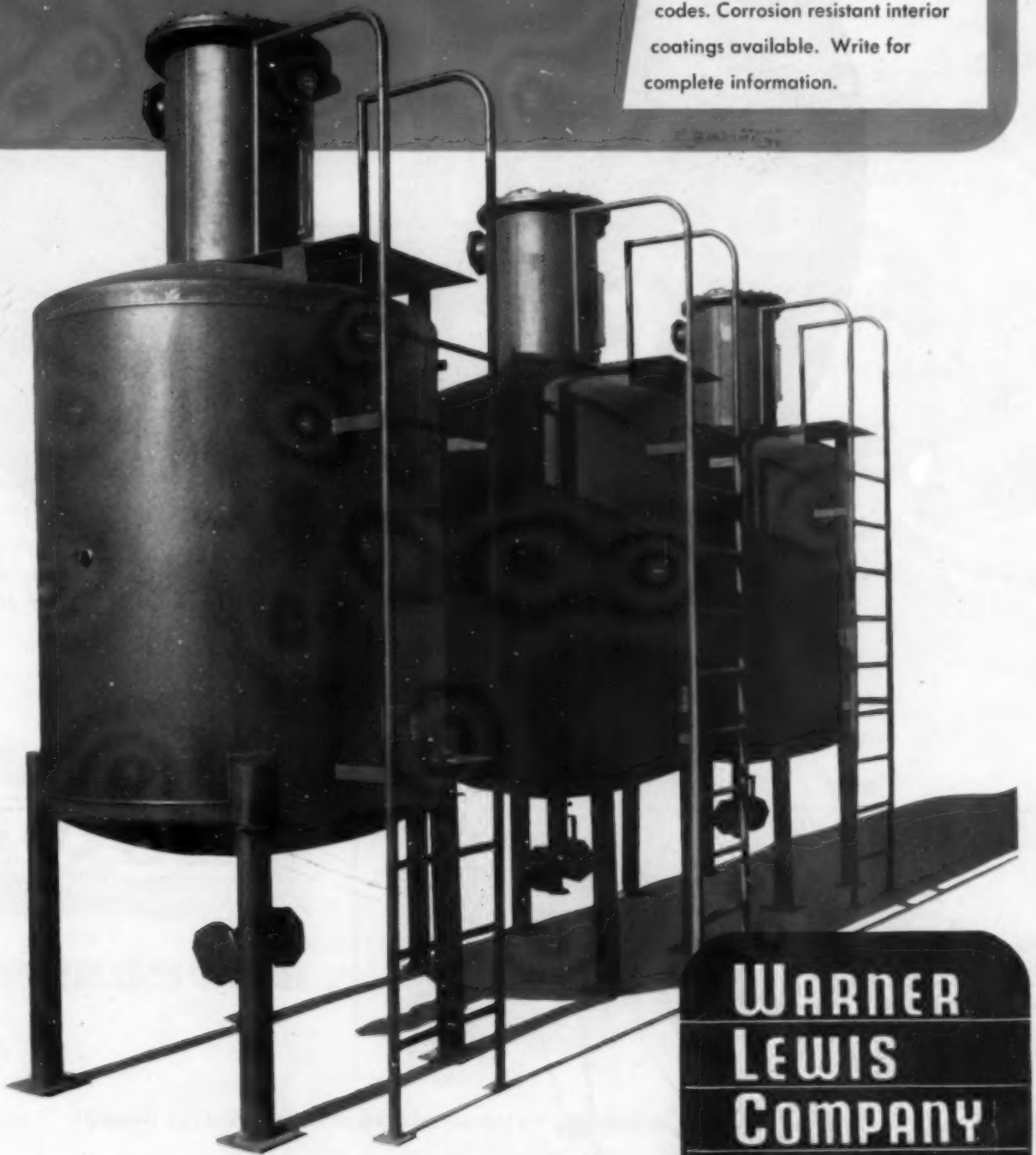
FORGE & TOOL WORKS

729 MEADOW STREET, ALLENTOWN, PENNA.

large capacity pipeline meter calibrating tanks

Let our years of experience in the design and fabrication of these tanks help in your planning of meter calibrating tank installations.

Built to API code 1101 (tentative) and API-ASME codes. Corrosion resistant interior coatings available. Write for complete information.



WARNER LEWIS COMPANY

BOX 3096 • TULSA, OKLAHOMA

DIVISION OF FRAM CORPORATION

For more data on advertised products, use Readers' Service Cards, last page.

AIR
TO
SPARE

...that's the secret of

CLARK TURBO-*SUPER*CHARGING

Obviously, any turbocharged 2-cycle engine must be supercharged. The extent to which it is supercharged is dependent on the volume of air and the pressure level maintained.

There's air to spare in Clark Turbocharged Compressors, even though a supercharging pressure of 6 psig is maintained at rated load and increased to 10 psig at maximum load.

Elevated pressures alone are not enough. While high pressure is desirable to increase power output, it must be accompanied by a sufficient volume of air: (1) To insure thorough scavenging with a cool, pure air charge for efficient combustion; (2) To thoroughly cool the power cylinder walls for proper lubrication of pistons, rings and cylinder walls.

Conversely, lower pressure supercharging reduces potential power output or results in "highly optimistic" ratings.

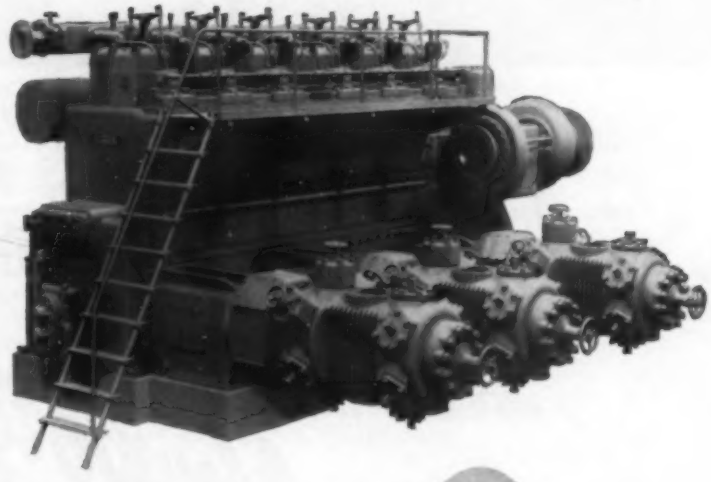
The only practical way to turbo-supercharge, therefore, is to provide a substantial volume of air at elevated pressures and to maintain the volume in proportion to the load placed on the engine. *That's precisely what Clark Turbo-Supercharging does!* The unusually high efficiency of the Clark Turbocharger permits pumping air at sufficient pressure and volume so that power output per cylinder can be increased from 33 to 65% over comparable non-turbocharged units, while cylinder wall temperatures are actually reduced.

Economical to install and operate, Clark Turbocharged Compressors are built in 8 sizes covering an 1100 to 3300 BHP range. Your nearest Clark representative has complete details. Write for Bulletin 134.

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales offices in Principal Cities throughout the World

CLARK®

COMPRESSORS



Clark sets the pace in compressor progress

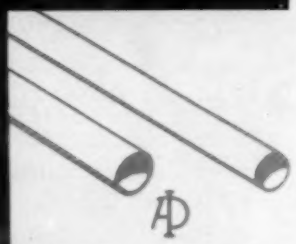
75 YEARS 1880—1955

For more data on advertised products, use Readers' Service Cards, last page.

Newport Steel

EXPERIENCE, YOUTH, NEW FACILITIES ADD UP TO BETTER LINE PIPE*

Basic ingredients of the best line pipe are experience and skill, modern facilities and youthful drive. At this mill 25% of the personnel have served 25 years or more. And young men devoted to the improvement of quality and service are increasingly attracted by Newport's many new facilities. Combine these assets with freight-saving location on the Mississippi-Ohio River system and you have a most logical source indeed for your line pipe requirements. Check with Newport before you buy 4" and 6" electric weld line pipe, or any other of the products listed.



***SIZES AND WEIGHTS AVAILABLE**

O.D.	Wall	Wt. Per Ft.
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.134"	9.29
	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

ECONOMICAL WATERAIL-TRUCK DELIVERY

Newport Steel is ideally situated on the Mississippi-Ohio River system and the great Cincinnati rail-truck hub. New barge facilities, 7 major railroads and 143 motor carriers enable Newport to give economical, dependable delivery to the entire area of the Middle West and South.

PRODUCTS OF NEWPORT STEEL

- Cold-Rolled Sheets
- Hot-Rolled Steel in Coil
- Hot-Rolled Pickled Steel in Coil
- Hot-Rolled Sheets
- Hot-Rolled Pickled Sheets
- Galvanized Sheets
- Galvannealed Sheets
- Colorbond Sheets
- Electrical Sheets
- Alloy Sheets and Plates
- Electric Weld Line Pipe
- Roofing and Siding
- Eave Trough and Conductor Pipe
- Culverts

Newport Steel

CORPORATION

NEWPORT, KENTUCKY

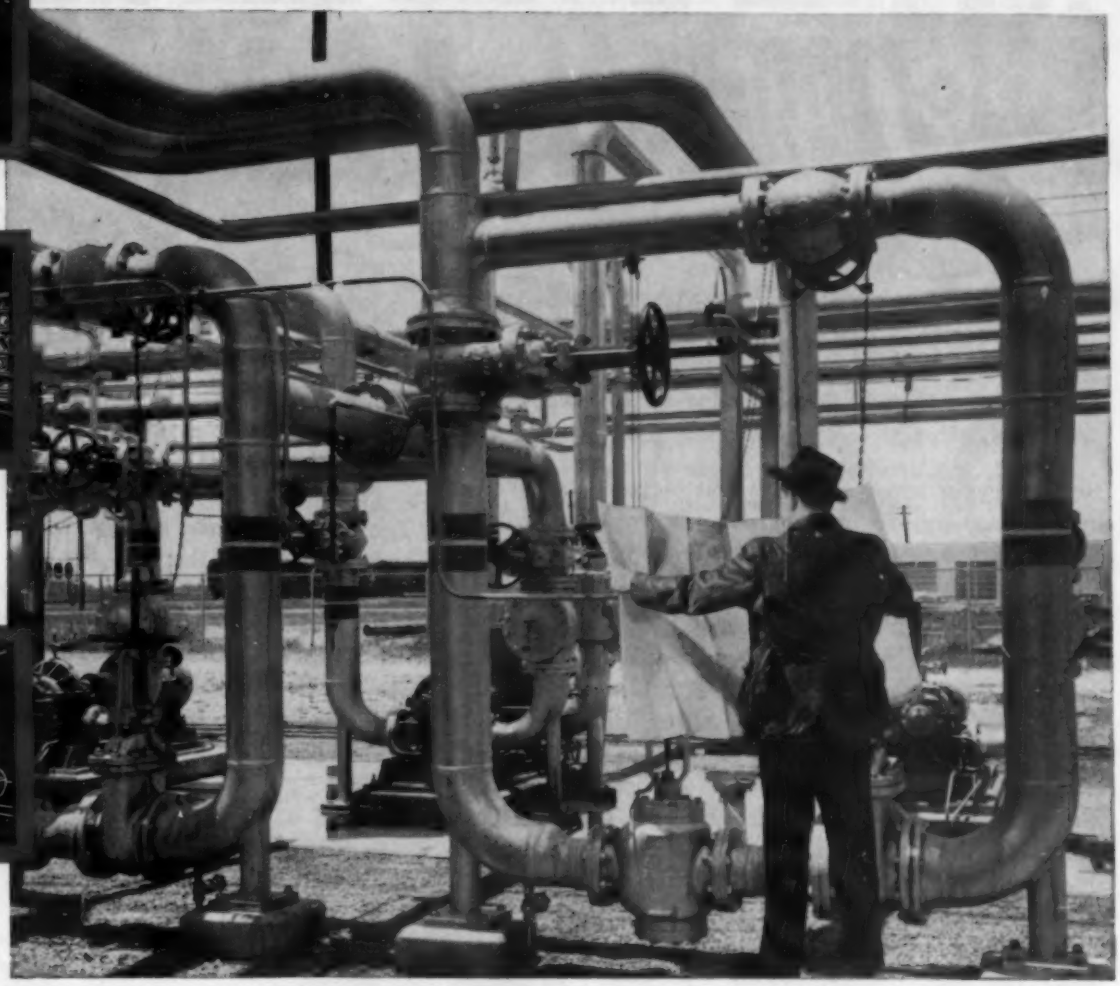
YOUR CONFIDENCE IS JUSTIFIED WHERE THIS FLAG FLIES

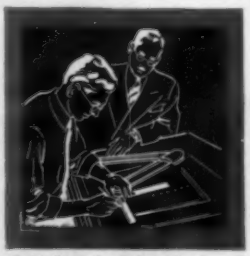
A SUBSIDIARY OF MERRITT-CHAPMAN & SCOTT CORPORATION

WHY IT PAYS TO DO BUSINESS WITH THE LEADER

Tube Turns' nearby complete stock SAVES YOUR PURCHASING TIME

Tube Turns' pioneering research GIVES YOU ADVANCED PRODUCTS





Tube Turns' engineering help GIVES YOU COST-CUTTING IDEAS

How complete-line service gives you *more for your money!*

YOU SAVE PURCHASING TIME and are *sure* of getting the *right* fitting and flange for every job when you specify "TUBE-TURN"* and buy this leading line from your Tube Turns' Distributor. One source . . . one order takes care of all your needs with a selection of over 4,000 top-quality items. You cut red tape and avoid shopping around. Call your Tube Turns' Distributor for all your needs in welding fittings and flanges.

*"TUBE-TURN" and "Tube-Turn" Reg. U. S. Pat. Off.

TUBE-TURN Welding Fittings and Flanges are made in U. S. A.
They meet all U. S. piping code specifications

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Denver • Los Angeles San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

THE PIPE-LAYING PERFORMANCE

Allis-Chalmers presents

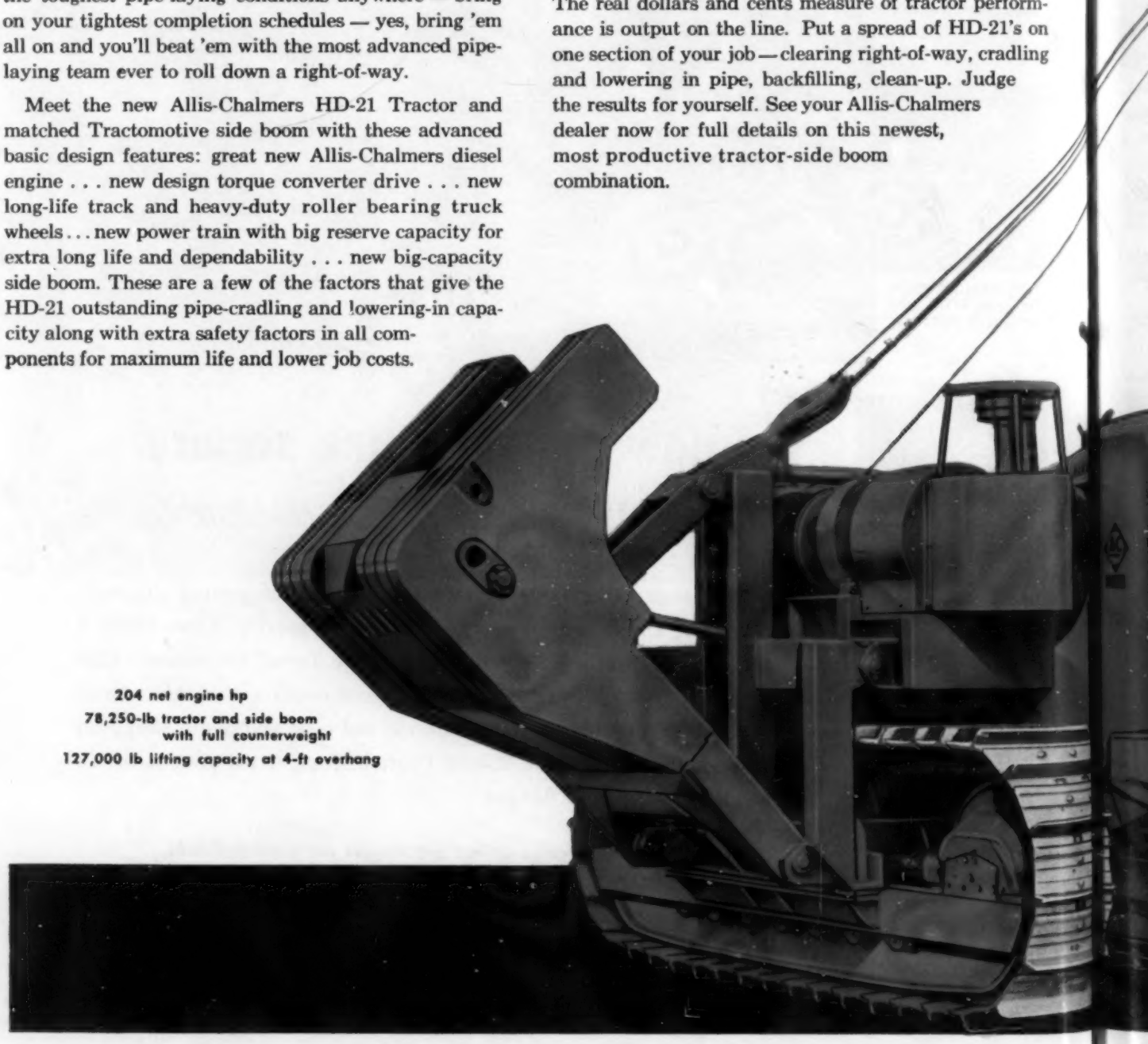
Tractomotive Side Boom

Bring on your super-inch pipe and bigger — bring on the toughest pipe-laying conditions anywhere — bring on your tightest completion schedules — yes, bring 'em all on and you'll beat 'em with the most advanced pipe-laying team ever to roll down a right-of-way.

Meet the new Allis-Chalmers HD-21 Tractor and matched Tractomotive side boom with these advanced basic design features: great new Allis-Chalmers diesel engine . . . new design torque converter drive . . . new long-life track and heavy-duty roller bearing truck wheels . . . new power train with big reserve capacity for extra long life and dependability . . . new big-capacity side boom. These are a few of the factors that give the HD-21 outstanding pipe-cradling and lowering-in capacity along with extra safety factors in all components for maximum life and lower job costs.

Make a spread-for-spread comparison

The real dollars and cents measure of tractor performance is output on the line. Put a spread of HD-21's on one section of your job — clearing right-of-way, cradling and lowering in pipe, backfilling, clean-up. Judge the results for yourself. See your Allis-Chalmers dealer now for full details on this newest, most productive tractor-side boom combination.



204 net engine hp
78,250-lb tractor and side boom with full counterweight
127,000 lb lifting capacity at 4-ft overhang

LEADER STEPS AHEAD AGAIN!

the new HD-21 Tractor with

Allis-Chalmers—
Pacemaker in Pipe-Line Tractor Progress

New ideas, pioneered by Allis-Chalmers, have played an important part in today's safer, more productive tractor-side boom combinations. Here are some of the *tested and proved* advances you get on Allis-Chalmers tractors and side booms.

- **Torque Converter Drive** — Allis-Chalmers introduced it in crawler tractors in 1940 and now stands behind a record of outstanding torque converter performance.
- **Outstanding Stability** — The HD-21 has outstanding flotation and stability with 84-in. center-to-center width, up to 28-in. track shoes and long, 7-truck roller track. This, plus hydraulically extendable counterweights that pivot at bottom, provide the balance and traction for booming out heavy loads. Racks and weights are mounted high for maximum clearance on narrow right-of-ways, or in deep mud. Safety linkage prevents counterweights from dropping.
- **Quick-On, Quick-Off Sectional Frames,** pin-connected for quick installation and removal . . . makes it easy to ship or service tractor.
- **Constant Mesh, Helical Gear Side Boom Transmission** — Four speeds for load line and boom control; one reverse speed for power lowering.
- **Sure-Gripping, Internal-Expanding Side Boom Brakes** — provide positive control of load and boom line drums. Completely enclosed from dirt and moisture.

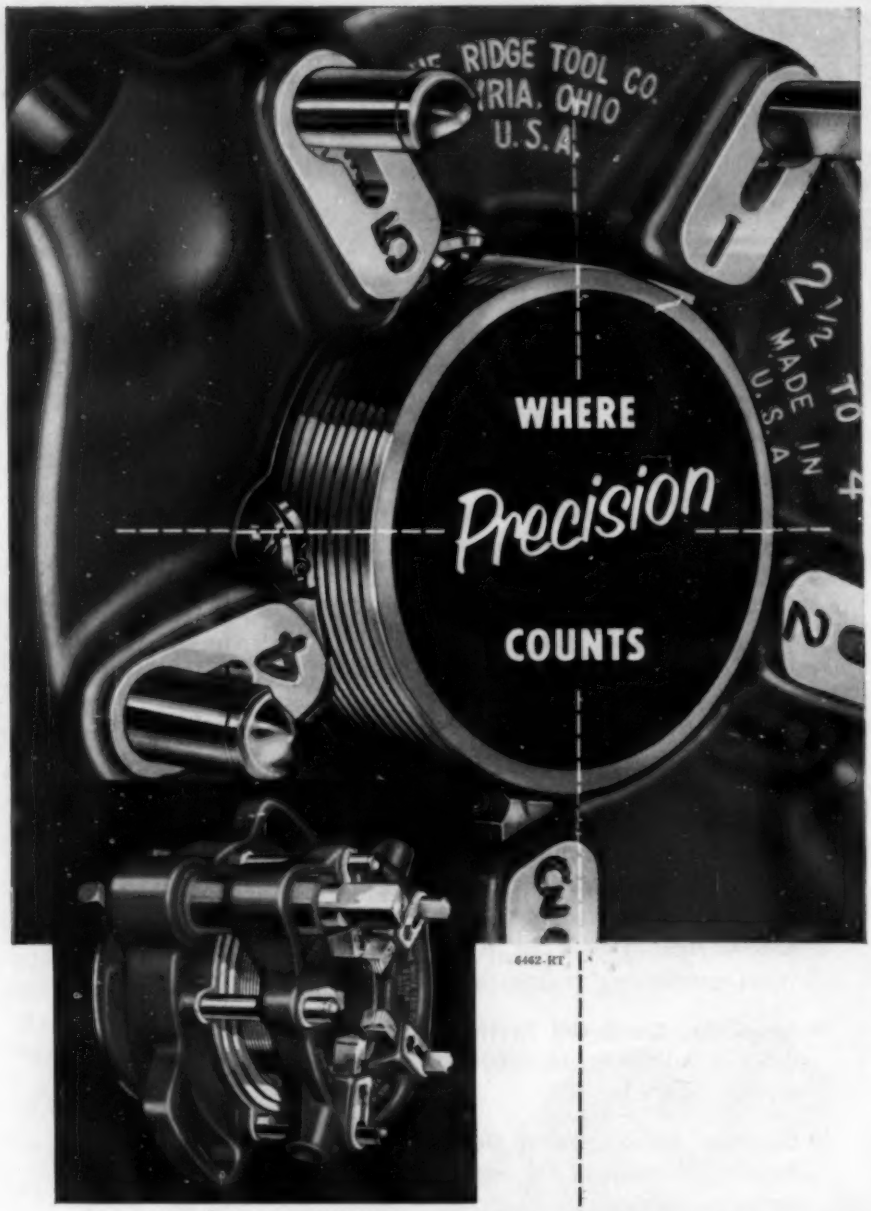
Plus this combination of additional proved features you can't get from anyone but Allis-Chalmers at any price:

- All-Steel Box-A Main Frame
- Straddle-Mounted Final Drive Gears
- 1,000-Hour Truck Wheel Lubrication
- Oil-Enclosed Track Release Mechanism

CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

For more data on advertised products, use Readers' Service Cards, last page.



...use the RIDGID 4P

2½" TO 4" GEARED PIPE THREADER

Here's a work-saving precision tool that cuts accurate threads on 2½" to 4" pipe *every time.* It's easy to handle . . . easy to use . . . foolproof.

Operated manually or with power, the RIDGID 4P reduces time, sweat and scrap in any piping job. Balanced handles simplify carrying and starting on pipe. Mistake-proof workholder sets to size *before* tool is put on pipe . . . has only one screw to tighten . . . no bushings.

For precision and speed . . . you can't beat the RIDGID *4P!*

See your local supplier . . . or write direct for catalog.

RIDGID
WORK-SAVER PIPE TOOLS

MANUFACTURED BY THE RIDGE TOOL CO. • 539 CLARK STREET • ELYRIA, OHIO

WHO'S MEETING WHERE

SEPT. 11–13	Independent Natural Gas Association of America, Jasper Park Lodge, Jasper, Alberta.
12–14	American Institute of Electrical Engineers, Electrical Conference of the Petroleum Industry, Shamrock Hotel, Houston.
12–16	Instrument Society of America, Conference and Exhibit, Shrine Auditorium, Los Angeles.
12–16	American Institute of Electrical Engineers, Instrument Conference, Shrine Auditorium, Los Angeles.
12–16	Corrosion Short Course, Washington University and St. Louis Section, National Association of Corrosion Engineers, St. Louis.
13–24	International Instrument Congress and Exposition, Philadelphia.
14–15	Accident Prevention Conference, Sponsored by American Gas Association and Southern Gas Association, Marion Hotel, Little Rock, Ark.
14–16	National Petroleum Association, Annual Meeting, Traymore Hotel, Atlantic City, N.J.
22–23	Mid-Continent Oil & Gas Association, Louisiana-Arkansas Division, Membership Meeting, Roosevelt Hotel, New Orleans.
22–23	Products Pipe Line Control and Dispatching Group, Annual Meeting, Lennox Hotel, St. Louis.
25–29	American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Roosevelt Hotel, New Orleans.
25–30	International Gas Union Conference, Hotel New Yorker, New York.
26–28	Petroleum Electric Power Association, Adolphus Hotel, Dallas.
28–29	American Institute of Electrical Engineers, Industrial Electronics Conference, Rackham Memorial Auditorium, Detroit.
OCT. 2– 6	American Society for Testing Materials D-2, Petroleum Products and Lubricants, Statler Hotel, Washington.
3– 7	American Institute of Electrical Engineers, Morrison Hotel, Chicago.
9–15	American Petroleum Institute, Oil Progress Week.
12–14	National Association of Corrosion Engineers, Permian Basin Corrosion Tour, Lincoln Hotel, Odessa, Texas.
17–19	American Gas Association and Pacific Coast Gas Association, Ambassador, Biltmore and Statler Hotels, Los Angeles.
17–21	National Safety Congress, National Safety Council, Chicago.
18–20	American Institute of Electrical Engineers (Motor Applications and Problems in Heating and Cooling Conference), St. Louis.
18–21	National Association of Corrosion Engineers, South Central Regional Meeting, Shamrock Hotel, Houston.
21–23	First Cuban Congress on Petroleum, Sponsored by Universidad de Oriente (University of Oriente), Santiago de Cuba.
24–26	American Standards Association, Annual Meeting, Sheraton Park Hotel, Washington, D.C.
24–27	National Association of Railroad and Utilities Commissioners, Natural Gas Panel Discussion, Asheville, N.C.
24–28	American Society of Civil Engineers, Statler Hotel, New York.
27–29	Rocky Mountain Oil & Gas Association, Cosmopolitan Hotel, Denver.
31–Nov. 1	Independent Petroleum Association of America, Jefferson Hotel, St. Louis.
NOV. 1– 3	National Association of Corrosion Engineers, Northeast Regional Meeting, Hotel Niagara Falls, Niagara Falls.
2– 4	Society of Automotive Engineers, Diesel Engine Meeting, Chase Hotel, St. Louis.

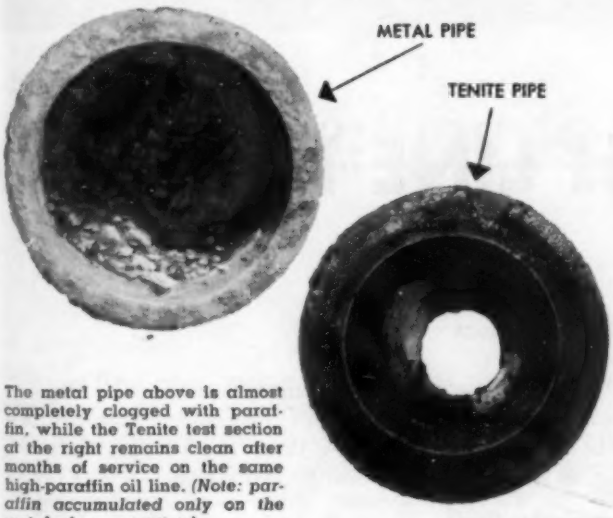
Butyrate pipe means less load on pumps

The low frictional resistance of Tenite Butyrate's smooth interior wall gives you up to 40% greater flow volume than does metal pipe for the same head loss.

Butyrate pipe means less maintenance

You can bury Tenite Butyrate pipe without corrosion worries. Tenite resists corrosion by sour crudes, salt water and electrolytic soils.

Butyrate pipe means less downtime



The metal pipe above is almost completely clogged with paraffin, while the Tenite test section at the right remains clean after months of service on the same high-paraffin oil line. *(Note: paraffin accumulated only on the metal pipe connector.)*

What problems could Tenite Butyrate lessen for you?

TENITE BUTYRATE PIPE ends many of the troubles you encounter with metal pipe. For example, using Tenite, you can quickly cross off corrosion failures. If paraffin accumulation has been your problem, you'll find that few, if any, cleanings are necessary when your paraffin-laden crudes are sent through Tenite lines.

Does your pipe have to be hauled over long, difficult distances? Then, you'll like the light weight of Tenite—it is only 1/12th as heavy as the cement-lined metal pipe you may now be using. Tenite even helps your pumping costs, lets you use smaller pumps and less power. Best of all, Tenite is the easiest pipe to install. You just solvent weld slip-sleeve couplings to the pipe ends.

Look into the record of Tenite Butyrate pipe in oil field service. Our technical staff will give you full information and help you adapt Tenite pipe to your operations. EASTMAN CHEMICAL PRODUCTS, INC., Kingsport, Tenn., subsidiary of Eastman Kodak Company.

TENITE
BUTYRATE
an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.

KINGSPORT, TENNESSEE

Please send me information on TENITE BUTYRATE PIPE and a list of companies manufacturing Tenite pipe and fittings.

NAME .....

POSITION .....

COMPANY .....

STREET .....

CITY ..... STATE .....

PLI-955

Mountains and desert—Pacific Gas and Electric Company's emergency repair program covers both.

SUPER-INCH LINE FAILURE:

By E. HOWARD FISHER, Pacific Gas and Electric Company, San Francisco

TODAY'S SUPER-INCH gas transmission lines, capable of carrying greater volumes of gas per unit diameter, have placed virtually complete dependence on a single large line in many locations. Failure of one of these main arteries could cause almost immediate distress to distribution centers during critical load periods.

To offset this danger, Pacific Gas and Electric Company set up a committee of superintendents, foremen and engineers to study the problem of reducing downtime caused by a rupture. Out of this study came a program designed to reduce downtime to less than 12 hours for a failure at any point on the line. This is less than half the time that might have once been lost by a rupture.

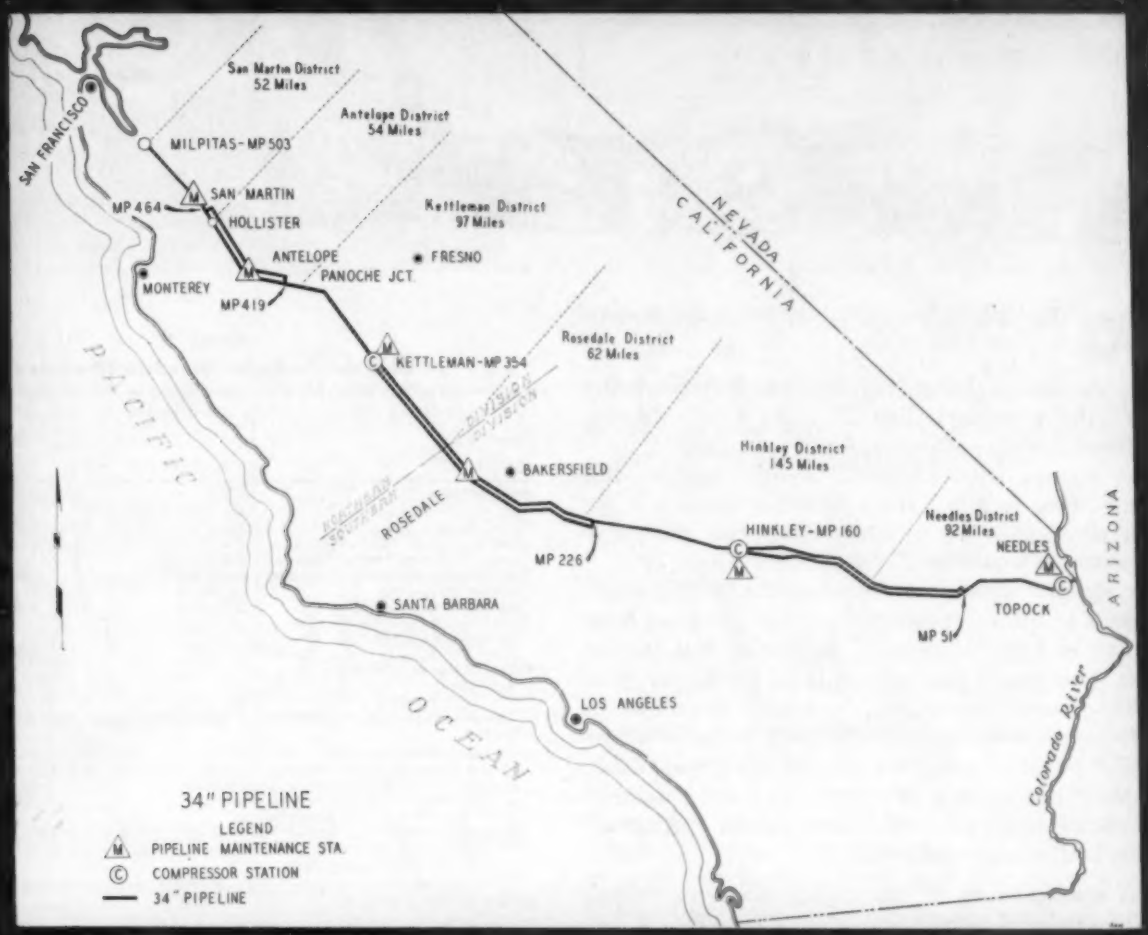
Pacific Gas and Electric Company constructed a 34-inch line in 1949 from the California border near Topock to Milpitas, Calif., 503 miles away. Some 280 miles of the line later was looped by 34-inch; 220 miles remain a single line.

The operating and maintenance forces for the Department of Pipe Line Operations are divided into six districts (Figure 1). Three of these are in the Northern division and three in the Southern division.

Communications. The primary system of communications is a telephone circuit supporting voice carrier, telemetering and teletype channels. Secondary communications are five two-way radio base stations. All strategic maintenance vehicles are radio-equipped. As originally organized, each district has sufficient personnel and equipment to perform the day-to-day work load. Handling of a major emergency project required reinforcement by neighboring districts.

To minimize the expense of heavy equipment moves, such machinery as trench hoes, truck cranes, tractor-dozers, truck tractors and semi-trailers were headquartered in strategic locations for use in adjacent districts.

These units of heavy equipment were available: two



Limit Downtime to 12 Hours!

trench hoes, one was a crawler-type requiring trailer transportation; three tractor-dozers, two were in the northern divisions and one was based in the south; three truck tractors and semi-trailers required for transporting bulldozers, and one heavy truck and pipe dolly unit in the northern division.

Planning for Emergencies. The committee composed of superintendents, foremen and engineers first met in 1954 to study the problem of reducing downtime in event of a rupture.

Several hypothetical cases were studied. In each case the failure was assumed to be a complete severance of the line, necessitating cutting out the damaged section and installing a new section of pipe.

Loss of inventory was a vital consideration. The entire inventory between attended stations was assumed to be lost before a possible failure could be located and isolated. Under normal conditions, the original repair organization would require from 12 to 30 hours to restore service. This included time to locate the failure, excavate, prepare for and make repairs to the pipe, and replace the lost inventory. The possible time losses due to adverse weather or delays caused by equipment failure were not predicted. Minimum time represents ideal circumstances; maximum time assumes wide dispersal of men and equipment at the time of the break.

Consider two of the hypothetical cases (See Figure 1).

CASE 1—Assume a failure at Mile 35 in the single-line section between Topock compressor station and Hinkley compressor station. All men and equipment are called in from Hinkley and Rosedale districts to aid the Needles district. Kettleman district will send welders and welding equipment. Estimated downtime was 29 hours, including

MAINTENANCE

time required to replace lost inventory using the original repair program. (See Table 1)

CASE 2—Assume a failure in the terminal single-line section of the super-inch line 23 miles from Milpitas. Again the entire division complement was called in to make the repairs, with additional welders and welding equipment being supplied from Rosedale district in the Southern division. Again under the original plan, estimated downtime would be 23 hours. (See Table 2)

Under summer conditions, interruptions of this length would result in the substitution of costlier gas from other sources and the curtailment of industrial and electric plant use. This would cost an estimated $4000 per hour. But of far greater importance, in winter we might be unable to supply firm customers below a mean temperature of 43° F., after using the limited storage available.

A 12-hour interruption of supply was the maximum period that could be allowed before serious curtailment of firm gas customers would result.

Principal weaknesses in the original emergency repair organization pointed out:

TABLE 1

Case No. 1—Repair Schedule (Predicted)

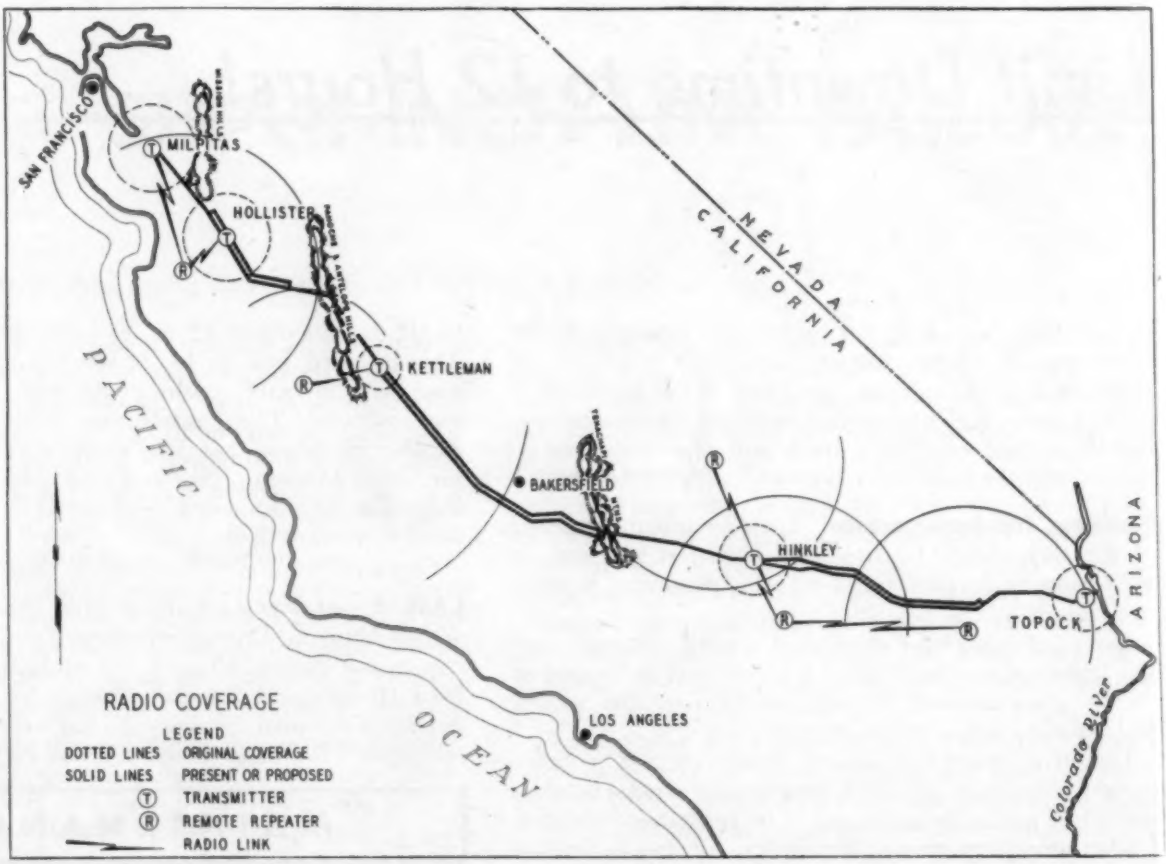
CONDITION	Equip. on Job	Men	Time	Accumulative Time Hrs.	Min.
Rupture Occurs	None	0	2:00P	0	0
First effective crew arrives (Needles)	D-4-Small Equip.	12	8:50P	6	50
Second effective crew arrives (Hinkley)	Small Equip.	4	8:30P	6	30
Third effective crew arrives (Hinkley)	Hoe-D-6-Boom	6	11:00P	9	0
Fourth effective crew arrives (Rosedale)	Small Equip.	4	1:30A	11	30
Fifth effective crew arrives (Kettleman)	Small Equip.	5	1:30A	..	..
Complete excavation	As Above	..	2:00A	12	0
Complete Fitting and Weld	8 Welders	..	8:00A	18	0
Replace Gas Inventory lost in blowout between Mile 30 and Mile 159— Total 269 Miles Including Parallel. (Topock packs to Mile 30 prior to completion)	.....	..	7:00P	29	0

The overall time could be shortened if following conditions were present or procedure followed:

1. Trench Hoe at Needles ..... Approx. 2 Hours Saved
2. D-6 Tractor Dozer at Needles ..... Approx. 1 Hour Saved
3. Start packing prior to completion of welding ..... Approx. 3 Hours Saved
4. Pack single line to Hinkley with loop closed ..... Approx. 4 Hours Saved (Items 3 and 4 not accumulative).
5. Begin compression at Hinkley Station as soon as favorable compression ratio is available, but prior to complete replacement of lost inventory. Time saved—dependent upon El Paso input

Time used would be lengthened greatly if ground conditions were wet and unstable or equipment failures occurred.

FIGURE 2



During critical load periods PG & E keeps repair equipment stationed near "vulnerable" single line sections of California super-inch. In photo at right, backhoe truck tires are fitted with tracks for muddy roads in mountainous terrain or sand in the desert.

TABLE 2
Case No. 2—Repair Schedule (Predicted)

CONDITION	Equip. on Job	Men	Time	Accumulative Time Hrs.	Min.
Rupture occurs		..	2:00P	0	0
First effective crew arrives (San Martin)	Small Equip.	4	4:30P	2	30
Second effective crew arrives (San Martin)	TD-18	3	6:30P	4	30
Third effective crew arrives (Antelope)	D-4-Boom S.E.	5	7:30P	5	30
Fourth effective crew arrives (Kettleman)	Small Equip.	8	9:00P	7	0
Fifth effective crew arrives (Kettleman)	Trench Hoe	2	12:00P	10	0
Sixth effective crew arrives (Rosedale)	Small Equip.	4	1:30A	11	30
Completion of Excavation	As Above	..	3:00A	14	30
Complete fitting and weld		..	9:00A	20	30
Recover Inventory Loss Mile 475.76 to Milpitas		..	12:00A	23	0
Kettleman packs to Valve 475.76 via Hollister prior to completion.					

Accumulative time could be shortened if following conditions were present:

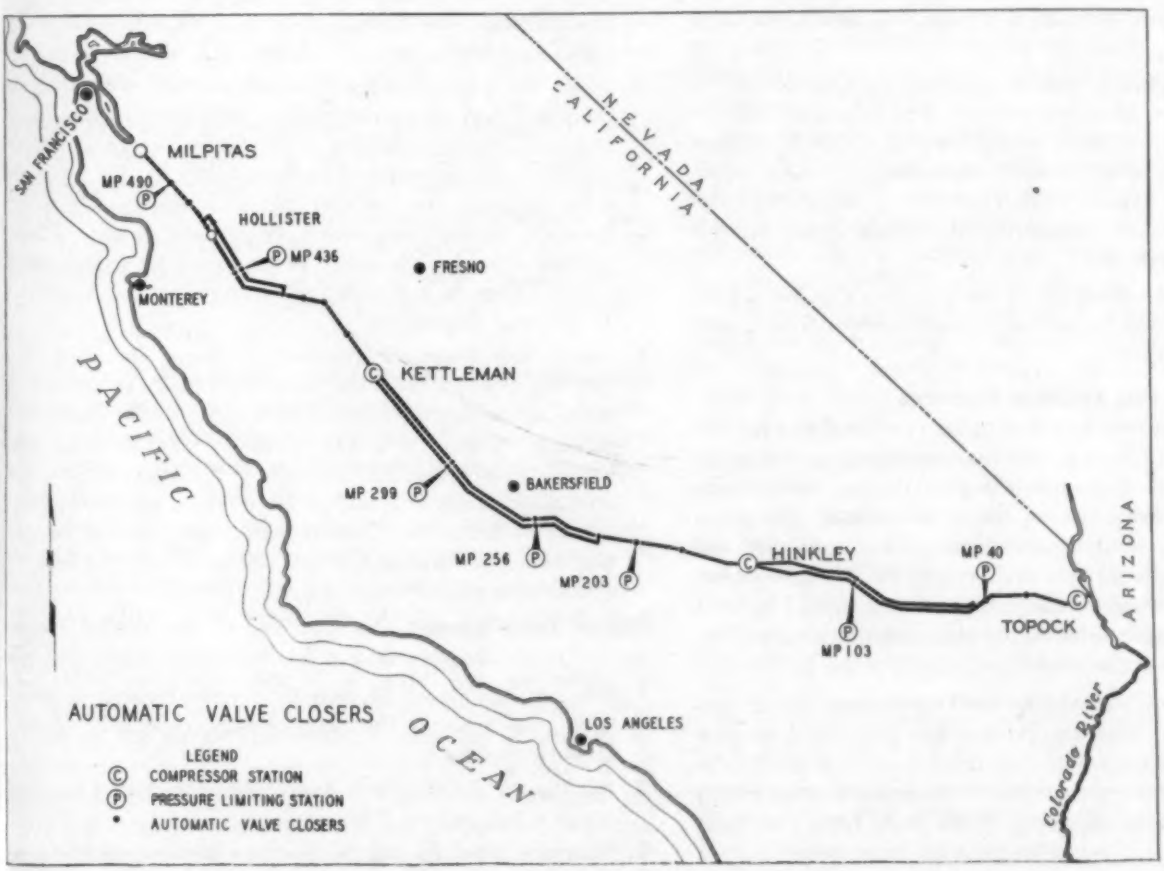
	Time Saved
1. Trench Hoe at San Martin	5½ Hours
2. Stanpac Trench Hoe available in 5 hours	4½ Hours
3. Contractor Trench Hoe available in 5 hours (These times not accumulative).	4½ Hours
4. Pack section partially before completion	1 Hour

Time used would be greatly lengthened if ground conditions were wet and unstable or equipment failures occurred.

1. Existing radio communication was too limited to be dependable.
2. Heavy excavating equipment was too widely dispersed.
3. Lack of procedure to be followed to maintain continuity of movement and repair would result in further lost time.
4. Loss of line inventory before break could be located and isolated would result in many hours delay in restoring service.
5. Any failure occurring in the approximately 100 miles of single line on the Northern division could result in almost immediate firm gas curtailment.

Complete Looping Not Economical. Complete paralleling of the 34-inch line would solve most of the problems. However, the economics of this, purely on the basis of standby, could not be justified. The looping program is based on capacity requirements and the looping at locations to alleviate the emergency situation would not be required for possibly five years. The cost of completing the looping would be approximately $22 million. This

FIGURE 3



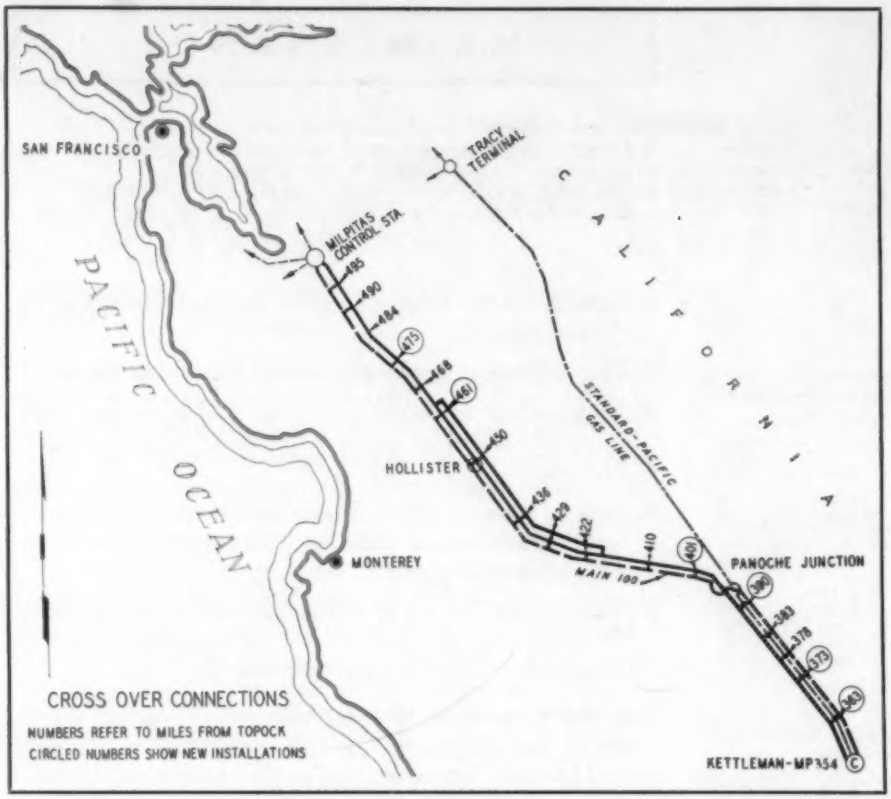


FIGURE 4

About the Author

E. HOWARD FISHER, general superintendent of pipe line operations for Pacific Gas and Electric Company's department of gas operations, was born in Pomeroy, Wash., and graduated from high school in Penticton, B. C. Fisher spent three years at the California Institute of Technology, and went on to Stanford University where he received his B.A. in engineering (1928) and an electrical engineering degree (1929).

represents interim fixed and operating charges of about $3 million per year purely for standby.

Emergency Plan Uses Fast Mobile Equipment. The practical solution was to invest in services and equipment to reduce the downtime in event of a major rupture. A maximum period of 12 hours was chosen as a design point.

The first approach was to consider cutting down the distance between attended stations. For example, another station could have been added in the 160-mile section between Topock and Hinkley compressor stations. Close analysis of the hypothetical situations revealed that the goal of 12 hours maximum shutdown could not be achieved by this method.

This downtime limit could be economically and effectively realized only by use of modern technical aids and fast mobile equipment.

New Program Has Modern Features

1. Radio communications are to be extended so that the entire line will be within range as shown in Figure 2. This has been accomplished partially by using radio link control from two of the existing base stations to mountain transmitting locations. The area in the vicinity of Hollister base station and the Mojave Desert area is still only partially covered by radio. Surveys are now being conducted to alleviate this situation in the same manner as above.
2. Existing heavy excavating and repair equipment was relocated and new equipment was purchased so that such equipment would be immediately available at each of the four single-line sections. It was necessary to purchase two truck-mounted trench hoes, one bulldozer and two 2½-ton trucks with pipe dollies.
3. Procedures were established for acquainting each district crew with its coordinating function in the event of a major rupture and in the absence of specific instructions. With adequate radio coverage and the development of methods for determining break locations, adjacent district crews will be able to move immediately toward the rupture and receive final instructions by radio while enroute.
4. Plans were made to install automatic valve closures at 20-mile intervals on single lines, and at pressure limiting and junction stations as shown in Figure 3. These will limit the amount of inventory loss in the event of a major break. In addition, signaling devices are to be installed to indicate which valves are closed. These devices should be installed prior to winter's peak load period. This improvement alone could save as much as 11 hours of downtime.
5. Additional crossover connections were installed between the super-inch line and our old 20-inch supply main in the single 34-inch line sections in the Northern division (Figure 4). The purpose was to limit the length of the old 500 pounds per square inch gage operating pressure main to be used as an emergency bypass to 10 miles. This increased the amount of gas that could be bypassed, from 110 million cubic feet to 230 million cubic feet per day.

Other Time-Savers. In addition to the major items, several other changes were made for minor time savings.

1. Reserve lengths of 34-inch pipe were located at strategic points along the right-of-way, especially in the unlooped sections.
2. Additional small hand tools were purchased to cut repair time.
3. Strategic roads in the Tehachapi area were oiled to

insure passability in all weather conditions.

4. Road culvert was obtained for those districts subject to cloudburst conditions so that road repairs could be made quickly.

5. Tire tracks were bought for truck-mounted trench hoes to offset possible mud conditions in the Northern division and sand in the Southern division.

6. Improved pipe beveling machines were purchased for each of the four major maintenance stations. These reduced setting-up time to 5 minutes compared to 40 minutes under the old method.

Aerial Patrol Provides Rapid Emergency Transportation. An aerial patrol was begun in December, 1954, replacing the weekly auto patrol of major supply lines. In the following three months and in spite of adverse weather, 7528 pipe line miles were observed. The cost of this service was less than 20 cents per pipe line mile compared with 37 cents for the auto patrol. An experienced aerial patrol also can be effective during emergencies.

Arrangements are to be made for helicopter equipment on a call-out basis. This special equipment will be used in inaccessible terrain and in muddy areas where earthbound equipment would be unable to reach a break. Sources of this type of equipment are available in the Los Angeles and San Francisco areas.

Only a Few Additional Personnel Required. To make the emergency program function effectively, minor increases are being made in repair personnel to insure adequate seven-day strength. The aerial patrol helped offset this need because of savings in patrol time by regular forces. Some manpower augmentation has been made in the engineering and supervisory channels to insure proper operation and maximum effectiveness of the facilities and personnel. An increase in technical manpower is anticipated to handle the increase in communication and valve control equipment.

Good Training Is Important. Crew training was considered a very important phase of the emergency program. Basic plans were developed from a study of hypothetical situations so that continuity of movement would be realized in the event of line failure. Methods for locating ruptures were analyzed as well as methods of repair. Valving procedures in parallel sections and methods of maintaining service to large line taps were reviewed.

Emergency Provisions and Routine Maintenance Work Together. In the development of this program the conflict was recognized between efficiency of normal maintenance activities vs. efficiency of emergency operation. Normally, dispersal of men and equipment is best, but for emergencies all manpower and material must be held at strategic locations ready to move in the event of a line failure. A compromise was adopted for maximum over-all effect and insurance during the critical load period.

During the three months of heavy firm gas usage all heavy earthmoving equipment is located in close proximity to the single-line sections with the restriction of movement to locations where the unit can go out and return to its base in the same day. For the remainder of the year the emergency phase is relaxed and normal dispersal is allowed for efficiency of maintenance activities.

In addition to company sources of manpower and equipment, arrangements are being made for contract welders and welding equipment on a call-out basis.

Is the Program Adequate? Here is what it will do.

The plan scheduled for completion before the critical winter season of 1955-56, is designed to limit total downtime in the event of a major pipe line failure to 12 hours. It will enable us to maintain firm gas deliveries in all but two emergency situations:

1. Extreme muddy conditions, particularly on the northern half of the line, could still cause delays beyond the maximum design time. Special light equipment and additional manpower would be required. The company plans to obtain additional aid from its own division forces, and from other companies and contractors with which stand-by arrangements have been made. There is also the possibility that helicopter service can be used to great advantage.

2. If a break occurred in the 38-mile section of single line approaching the Milpitas station, there would be practically no line storage available. Even with the several crossover connections to the other supply line only a limited amount of gas could be bypassed around a break in the super-inch line because of the size and pressure limitations of the older line.

Under peak conditions the company would begin losing customers after only a few hours. The intention is to follow the only feasible protection possible for this section —to parallel the line at the earliest possible date. Looping plans for the immediate future include this section of line as a number one priority. The cost of this loop line will be an estimated $4 million.

While it is evident that complete standby protection will be realized only after the entire line is paralleled, this program allows the company to defer the cost of this measure except for the 38-mile section approaching Milpitas.

The program when fully developed will cost an estimated $318,000 for equipment and improvements, and an additional $4 million for looping the vital section, or an annual fixed and operating charge of approximately $500,000. This is reasonable as compared to the $3 million annual cost for complete looping.

An analysis revealed that the reduction in downtime could not be achieved by the obvious choices of increases in manpower and maintenance stations. Mechanization of original forces with fast mobile equipment and adoption of modern aids such as shutoff devices and adequate radio communications was the answer. The compromise between emergency organization and maintenance organization proved to be the proper manner of operation for over-all efficiency and insurance during critical load periods.

It is felt that this program is economically sound and will adequately solve the problem until complete looping is required for capacity purposes. —**The End**

ACKNOWLEDGMENT

This article taken from a paper presented at the Gas Supply, Storage and Transmission Conference, American Gas Association, May 9-10, 1955, Pittsburgh, Pa.

MAINTENANCE

CRANKSHAFTS:

How To Replace Them

LAST DECEMBER 2 in the main engine room of Texas Illinois Natural Gas Pipeline Company's Texarkana, Ark. compressor station the overspeed safety device on Unit No. 4 tripped and the engine whirred to a stop.

The main engineer in charge hastily took a look and, finding nothing wrong externally, decided the overspeed device simply had kicked out.

He turned the engine over slowly with air pressure . . . and noticed the 5-foot, 10-inch flywheel rotating erratically.

He immediately stopped the engine and removed the inspection plate at No. 10 cylinder.

A broken crankshaft!

When it had broken, it caused the flywheel to wobble just enough so that its edge tripped the overspeed switch.

On January 18 another crankshaft broke—this time at Station 302, Conroe, Texas. One week later, on January 25, a third snapped at 301, Wharton, Texas.

These crankshafts are 28 feet long and weigh 6.3 tons each. A tremendous force is required to snap one.

A quick check of the first broken shaft revealed it to be from the same foundry heat as a shaft which had broken for another pipe line company.

TI officials breathed easier, thinking this one foundry heat had resulted in defective steel . . . that TI was confronted probably with just one broken shaft.

But when two more shafts snapped, the initial theory dissipated.

Another look at the forging records revealed that all three broken crankshafts, plus nine others on the TI system, came from steel billets manufactured by a process different from that used in making the steel that went into TI's other shafts.

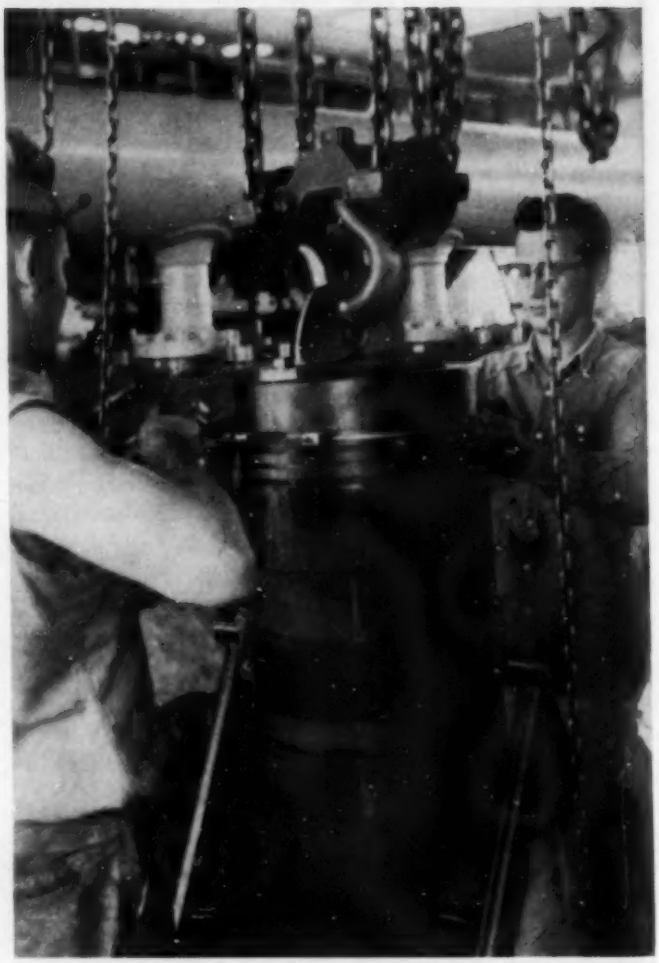
Immediate inspection of these nine suspect shafts revealed four of them to have visible cracks . . . and in a later reflectoscope inspection, the remaining five were classified as "bad."

There are two methods of foundry procedure in the making of steel for such purposes as the forging of our large crankshafts: "basic steel" and "acid steel."

If properly controlled, equally good steel can come from both methods. However, basic steel requires much more rigid control and is more susceptible to defects if some slight manufacturing error is made.

These defects appear as "hydrogen flashes" or "voids" in the metal . . . and not only reduce the metal's overall strength but provide points from which cracks may start.

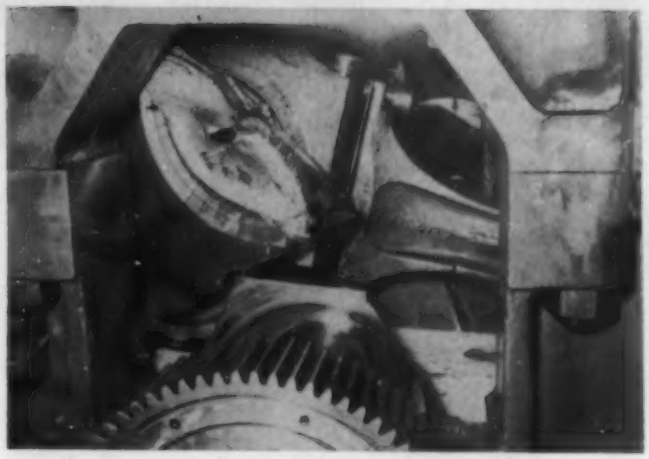
The TI crankshafts that broke were acquired at the time of material shortage due to the Korean war.



When four 28 feet long, 6.3 tons crankshafts broke, one right after the other, officials of Texas Illinois Natural Gas Pipeline Company went looking for the answer, and found it. In top photo two overhead hoists remove a broken crankshaft from an engine at Station 305, Texarkana, Ark., where the trouble began. New shaft was installed in a similar manner. Bottom photo shows the piston being removed.

Crankshaft Damage

At right, broken crankshaft before removal. Compressor connecting rod at right was cut to free crankshaft for removal. Photo at lower left shows broken No. 10 throw after removal from the engine. Slag inclusions are marked with chalk. In photo at lower right piston and connecting rod are removed. Note bend in the rod.



A 12-crankshaft-replacement program has been under way since the first of the year and all auxiliary engines have been checked and six are scheduled for replacement.

Dismantling of the main engine at Station 305 began the morning after the break occurred. Parts removed included the flywheel, gears, all ten cylinder heads, power pistons, cylinder linings, the oil pump and its associated piping at the engine, and the scavenging air inlet elbows.

Station 305 Superintendent E. J. Mueller reports the steps followed in the project:

"It was thought that the main frame should be stripped of as much weight as possible in order that it be moved easily. However, it was discovered later that the liners and scavenging air elbows could have been left in place without hindering the movement of the main frame.

"Sections of the jacket water headers and the exhaust header directly connected to the engine were disconnected and removed and the remaining portion of this piping was temporarily supported. A steel framework of 3-inch channel was made to support this piping and placed in a permanent position as close to the engine as possible . . . but in a place where it would not interfere with raising the main frame.

"It further proved necessary to provide an additional support for the jacket water return header. This header is made of 10-inch piping and extends 28 feet toward the engine from the 30-inch main header which runs along the side of the building. A 10-inch gate valve is located at the end of the header where the piping ties into the manifold of the engine.

"This gate valve could not be removed. A movable wooden support was fabricated and placed under the valve to support the weight of the piping and the valve. During the removal of the broken crankshaft and installation of the new one, it was necessary to remove this wooden support for short periods of time.

"The main frame of the engine is bolted to the base by a total of 188 studs and nuts. The nuts were removed after the frame had been stripped and the following preparations were then made for jacking up the main frame and sliding it over to clear the crankcase.

"Two 1-inch thick plates were fabricated to fit over the four studs which hold the No. 1 and No. 11 journal bearings. Spacers made of 1½-inch pipe held these plates off the machined crankshaft surfaces. With these plates as a base, 30-ton hydraulic jacks were inserted to bear against the main frame. A block of hardwood was placed between the jack head and the main frame to give a large bearing surface.

"Beginning with the flywheel end of the engine, the jacks raised alternate ends of the main frame in increments of about two inches. As the frame was raised, hardwood shims were placed between the base and the main frame for stability and as a precaution against failure of the jacks.

"When the frame was raised to a sufficient height,

MAINTENANCE

Bottom photo shows exhaust manifold being lowered from the engine. Other photos show cylinder heads and piston and rods lying on the floor after removal.

6-inch and 8-inch oak timbers with ⅜-inch and 3-inch steel runners were placed in position.

"The main frame then was let down upon these skids and, with the jacks in a horizontal position, the frame was skidded over the compressor rod housing. The steel runners were greased and the main frame was skidded over with very little difficulty. It was necessary to remove several studs completely in order to provide clearance for the timbers.

"Using two hoists, the broken crankshaft was picked up out of its bed and carried out of the building.

"No difficulty was encountered in moving the crankshaft through the building and lowering it out through the large main building door. There was sufficient clearance when angling the crankshaft from between the two engines into the aisle.

"The new crankshaft arrived by rail in an automobile car and was hauled out of the station on the pipe line department float. When the crankshaft was removed from the freight car it was taken out so that the flywheel end of the shaft was at the end of the float.

"This was the position required when the float was backed into the door of the main compressor building. One end of the crankshaft was picked up directly off the float by our overhead hoist and gradually snaked up onto the main building floor by changing grabs on it until we got to the approximate center of the shaft.

"In moving the shaft from the doorway and around Engine No. 1, down the aisle, and into the space between No. 3 and No. 4 engines, no trouble was encountered. At no time during the moving of this crankshaft were the cable slings attached to the bare crankshaft.

"The new crankshaft was lowered into the main engine base using the thrust bearing as a guide for centering of the crankshaft. The main frame then was skidded back into place and lowered down over the base. The same method of moving and lowering was used, except in reverse, as was employed in raising the main frame.

"On Thursday afternoon, January 20, the engine was started and brought up to 200 revolutions per minute and run for two hours. It was run again the following day at gradually increased speeds. On Monday afternoon, January 24, the engine was loaded to 1500 horsepower in order that preliminary balancing could be done. The next day the engine was up to full operating speed.

"Extraordinary safety measures were put into practice during the entire operation. Probably the most significant feature was the fact that before each phase of the work was started, the plans and procedures were thoroughly explained to the men involved so that all would have an understanding of what was being accomplished and could go ahead on schedule.

"The repair foreman was put in absolute charge of the project to avoid conflicting instructions. Since there was a three-week period before shipment of the new crankshaft, dismantling of the engine was done efficiently but not hurriedly. In all instances, the safety factor was the deciding element rather than the time factor. No injury of any nature occurred during the job.

"In moving the crankshafts through the building with the overhead hoist, the crankshaft was carried 1 inch off the floor. In that manner, in case of a hoist failure, the crankshaft would not have a long drop to the floor.

"Precautions were taken during this work on No. 4 engine so that the work would in no way interfere with the proper operation of the remaining five units. The majority of the parts removed from this engine were stored in the warehouse and spare garage so that the floor space in the main building would not be taken up with these parts."

Basically, the same procedure was followed at other stations where replacements were made.

ACKNOWLEDGMENT

Reprinted with permission of *Between the Lines*, employe publication of Natural Gas Pipeline Company of America, Texas Illinois Natural Gas Pipeline Company, Natural Gas Storage Company of Illinois, and Texoma Production Company.

LADISH

MULTIPLE OUTLET HEADERS

TO MARK PROGRESS

Simplify

PIPE LINE GATE SETTINGS

Ladish Multiple Outlet Headers provide seamless outlets in exact location for by-pass, blow-down and service line connections . . . eliminate costly and undesirable practice of nozzling-in branch connections and saddle reinforcements.

Ladish headers . . . available in virtually any variation of size, number or location of outlets, diameter and length of run . . . are a significant development resulting from co-operation of pipe line engineers and Ladish engineering experience and manufacturing facilities.

Other Ladish developments for the Pipe Line Industry include—HOT TAP REINFORCING TEES, EXTRA LONG RADIUS (3R) ELBOWS, ANCHOR FLANGES.

- **Save 70% in Welding Time***
- **Streamline Design of Gate Settings**
- **Eliminate Reinforcing Saddles**
- **Speed Construction**
- **Simplify Installation**

*REFERENCE: Panhandle Eastern Pipeline Co. article in March 7, 1955, Oil & Gas Journal. Reprints on request.

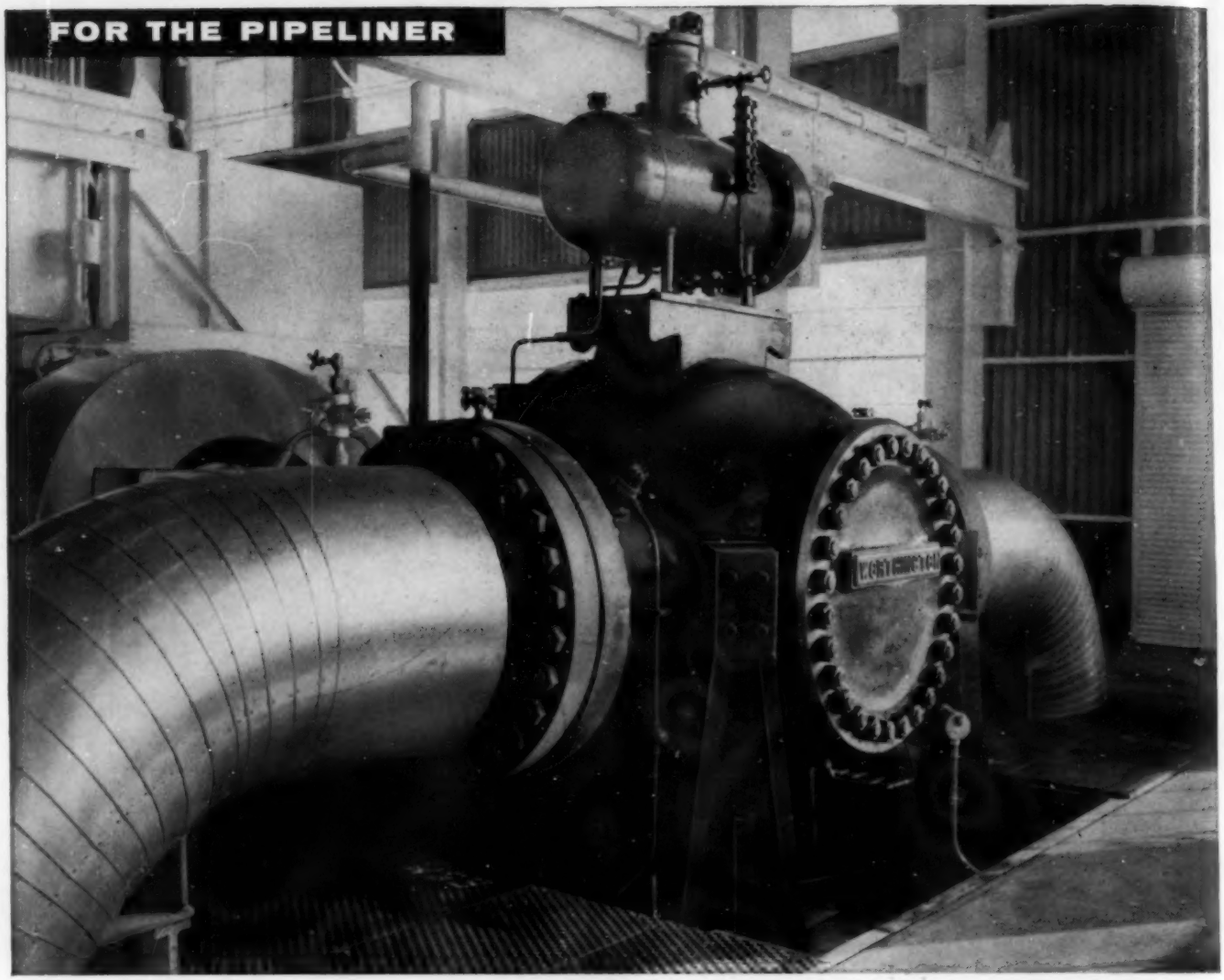
THE COMPLETE *Controlled Quality* FITTINGS LINE

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland
Chicago • St. Paul • St. Louis • Atlanta • Houston • Odessa • Tulsa
Los Angeles • San Francisco • Seattle • Havana • Mexico City • Brantford, Ont.

FOR THE PIPELINER



WORTHINGTON GUP CENTRIFUGAL COMPRESSOR installed in Northern Natural Gas Company's Compressor Station at Macksville, Kansas.

New design concept combats shaft distortion, seal-oil leakage in new centrifugal compressor

New design features give Worthington's new GUP a headstart on other compressors for gas transmission pipeline service.

The GUP's main casing and support design minimize shaft centerline distortions arising from high pressure in the casing. Compressor casing is basically spherical with heavy pedestals providing centerline support. Shaft barrel support is carried on rear casing cover with no other external restraint.

Spherical casing design provides a cavity behind the impeller as a safeguard against accidental seal-oil leakage into gas stream. Seal design itself has had extensive service on this type of compressor.

Among other features is an integral lubrication and seal-oil system that's independent of the driver lubrication system. An emergency oil tank supplies the seal and lubricates the bearings in the event of pump failure. No internal bearing mishap can result in starving another bearing.

Result: a reliable single-stage, heavy-duty machine designed for the full range of gas transmission pipeline service. For details, request bulletin C1100B57, Worthington Corporation, Section EK.5.4, Harrison, New Jersey.

WORTHINGTON

Economical, Continuous Power — Diesel, Dual-Fuel and Spark-Ignition Engines, from 200 to 5000 bhp.

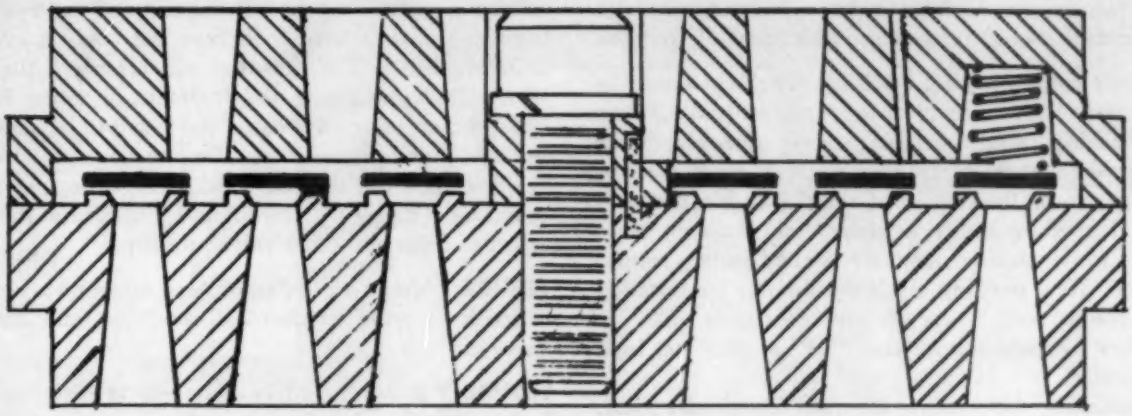


FIGURE A—Cross-section of typical disc-type compressor valve.

ENGINES AND COMPRESSORS:
Maintenance Musts

By **V. E. FORD,** Manager Field Engineering, Clark Bros. Company, Tulsa

IN ORDER TO MEET the increasing demand for higher plant efficiency and lower production costs, the problems of compressor maintenance become more and more important.

The amount of maintenance required to keep a compressor cylinder operating efficiently will vary to a large extent on the type of gas being handled. Generally speaking, a compressor handling clean dry gas or air requires very little maintenance, whereas one handling gas containing hydrogen sulfide, water, heavy hydrocarbons or other foreign matter will require a great deal more maintenance to keep it in even fair operating condition.

Special materials such as bakelite, nylon or stainless steel valve discs; bakelite or carbon piston rings and piston rod packing are often used with very satisfactory results where corrosive or wet gases are being handled.

Since one or more of these problems are encountered in nearly every plant, it can readily be seen that good maintenance is a "must" if the maximum efficiency is to be expected.

Inasmuch as a compressor cylinder assembly is made up of so few parts, mainly a cylinder barrel, a piston with rings and a set of intake and discharge valves, it appears as if there should be very little to maintain on one. This is essentially true; however, the maintenance of these few parts must be carried out in a most efficient manner if the best results are to be expected.

Cylinders and Cylinder Liners. Cylinders or liners will normally run for several years before a rebore job is necessary; however, if the gas being handled is wet or corrosive the life of a liner or cylinder barrel is usually shortened considerably.

The maximum allowable cylinder wear before reboring becomes necessary depends on the size of the cylinder, the pressure and temperature conditions under which it operates and the type of gas handled. It is generally considered that from .003" to .004" wear per inch of cylinder diameter is maximum before it is necessary to rebore.

Pistons. Pistons seldom wear enough to need replacing before the cylinder needs reboring; however, the ring grooves sometimes wear to where it is necessary to remachine them and install over-width rings.

Piston Rings. When replacing worn or broken piston rings, the first job is to select rings made of the material most suitable for the particular service. Ordinary cast iron rings are usually suitable for air or dry gas compressors operating at low pressure. Bronze or lead rings are usually suitable for both low and high pressures, providing the gas is free from H_2S or other acids or excess condensate that will destroy lubrication. Bakelite rings are suitable for low and reasonably high pressures where lubrication becomes a problem, providing operating temperatures are not too high. Carbon rings are suitable and used mainly on non-lubricated compressors.

When fitting new rings, the rings should have only enough side clearance in the grooves to permit them to move free at operating temperatures. The end clearance should also be kept at a minimum but should be sufficient to prevent the rings from butting at operating temperatures.

Lubrication. The type, weight and amount of lubrication

necessary for the proper lubrication will again vary with the service and should be given a great deal of thought.

Piston Rods and Metallic Packing. Packing should be removed periodically for cleaning and refitting. When refitting packing rings, the sharp rough edges should be removed with a scraper and the packing rings cleaned with crocus cloth. Packing cups should be cleaned and the joints lapped to insure a perfect seal between cups. Excessively worn packing rings or stretched springs should be replaced. New packing rings should not be installed on worn piston rods where the wear exceeds .008" to .010" on low pressure service and .004" to .005" on high pressure service.

When installing the packing assembly in cylinder head, care should be taken to make sure gland bolts are tightened evenly so that packing case remains square with the piston rod. Crosshead height should be adjusted if necessary, so that rod will run true in the packing. Worn piston rods should be reground and undersize packing rings installed, turned down and metalized or replaced when the wear becomes too great to permit installation of new packing.

When installing new piston rods in old pistons, extreme care should be taken to make certain that the piston is true on the rod and that the piston rod shoulders tight against piston boss. High-pressure packing should be broken in at reduced speed and reduced pressure for several hours if at all possible, before being put on full load and at full speed.

Valves. Without a doubt defective valves contribute more to compressor inefficiency than any other part of the compressor.

FIGURE A is a cross-sectional view of a typical disc type compressor valve. It should be noted that when the valve is in a closed position that a much greater disc area is exposed to pressure on one side than on the other. This means that the pressure inside the cylinder must be lower than intake nozzle pressure before the air intake valve will open and also means that the pressure inside the cylinder must be greater than discharge nozzle pressure before the discharge valve will open.

The amount of differential required to open the valves and the force with which the discs will strike the stop plates will depend to some extent on the difference in the exposed area on the two sides of the disc. This difference in area is governed by the actual width of the valve seat. The width of the seat should be kept at a minimum but not narrow enough to cause excessive seat wear. Usually the normal seat width will be around $\frac{3}{32}$ inch for the average disc valve.

The free lift of the valve disc is also very important and should be watched closely when reconditioning valves.

Low-pressure valves usually require a lift of .080 to .100 inch; medium-pressure valves .060 to .075 inch; and high-pressure valves .040 to .060 inch.

At any rate the most desirable lift is the minimum lift that will permit the cylinder to operate without capacity loss due to throttling through the valves.

Broken or warped valve discs either in the intake or discharge valves reduce the capacity of the cylinder tremendously. It is hard to believe that only a small piece being broken out of one disc will often cut the delivery of a cylinder as much as 50 percent or more. Broken or collapsed valve springs cause the valve to be slow in closing and usually permit the discs to bounce, which eventually causes the disc to break. The following indicator diagrams (Figures 1 through 7) illustrate the general effect of these numerous valve problems:

FIGURE 1 shows an indicator card taken on a compressor cylinder in good mechanical condition and the proper valve lift.

FIGURE 2 shows the effect of operating with one or more leaky or broken intake valves. Note, that due to leakage back through the intake valves the pressure does not build up normally in the cylinder on the discharge stroke and that gas is discharged during a much shorter portion of the stroke than normal, again resulting in capacity loss.

FIGURE 3 shows the effect of broken or leaky discharge valves. Note, that as the compressor pistons begin to travel back on the intake stroke that the re-expansion line is much longer than normal, resulting in a shorter period during which a fresh charge of gas is actually being taken into the cylinder. It will be further noted that the pressure in the cylinder begins to rise immediately at the end of the intake stroke, resulting in a considerable increase in actual horsepower consumed and a decrease in gas volume handled.

FIGURE 4 shows a cylinder with discharge valves having too little lift, resulting in pressure inside the cylinder at the end of the discharge stroke well above normal, also resulting in a reduction in cylinder delivery as well as increased discharge temperature and extra load on the engine itself.

FIGURE 5 shows a cylinder with intake valves having too little lift. Note that the pressure inside the cylinder at the end of the intake stroke is below normal intake pressure. This results in a proportional loss in delivery capacity.

FIGURE 6 shows the effect of too heavy springs behind the discs in the discharge valves.

FIGURE 7 shows the effect of using too heavy springs behind intake valve discs.

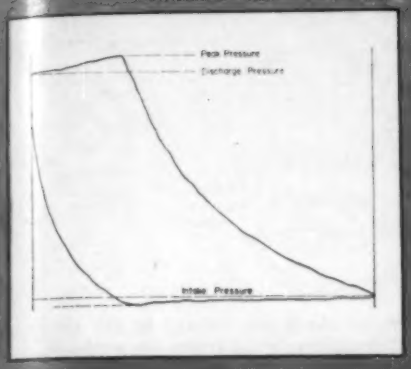
It also will be noted that where valves have the improper lift, too heavy springs, or the seats are too wide, that the maximum and minimum pressures inside the cylinder are increased greatly. This directly increases the bearing and piston rod loading which is not desirable and in some cases dangerous.

In addition to the actual maintenance of the compressors a great deal can be accomplished in reducing maintenance by proper design and installation of piping, pulsation dampners and liquid scrubbers, both on the intake and discharge sides of the compressors. Liquid, even in very small quantities can be detrimental to the operation of a compressor. Every precaution should be taken not only to provide adequate scrubbers and drains to remove all trace of intrained liquid, but operators should also see that they are drained regularly.

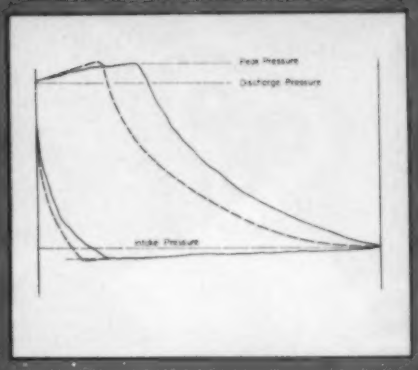
ACKNOWLEDGMENT

The writer thanks NGAA for permission to publish this paper based on a presentation at a regional NGAA meeting held in Oklahoma City.

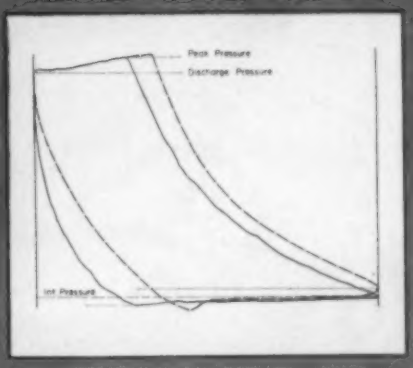
MAINTENANCE



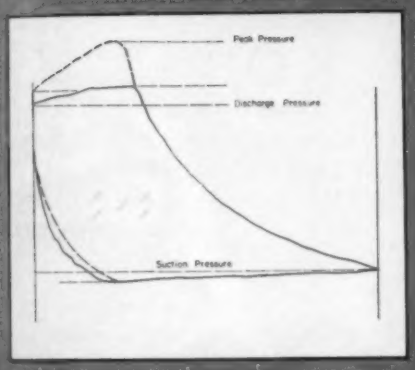
1



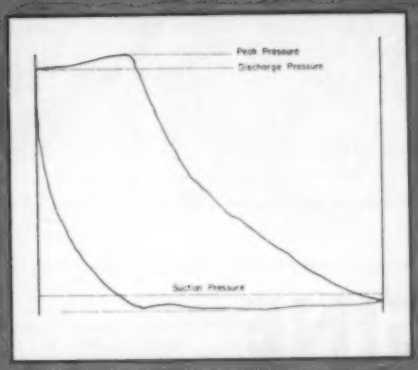
2



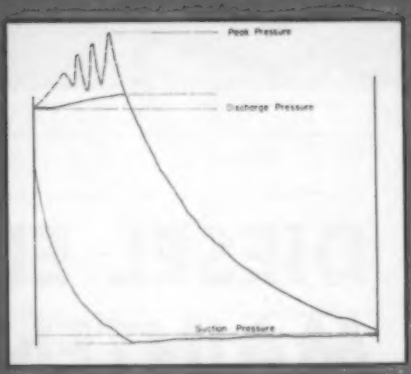
3



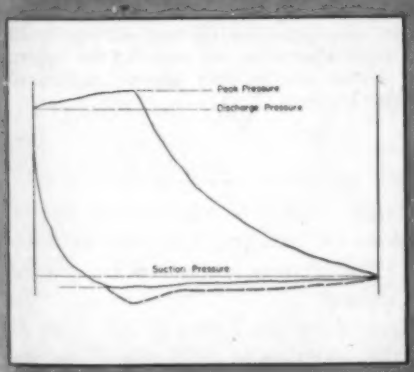
4



5



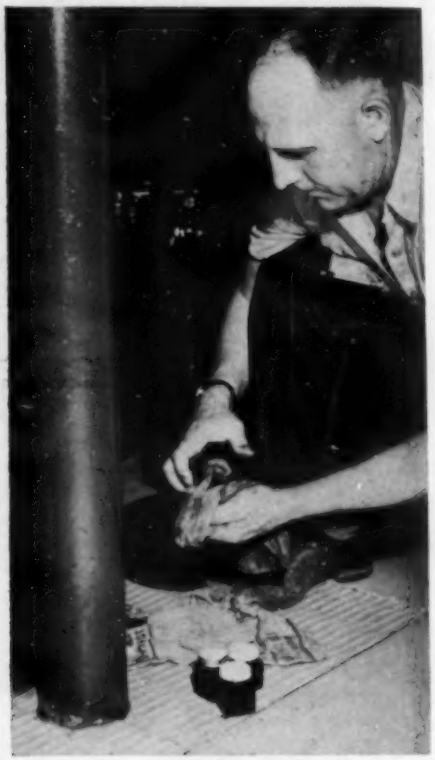
6



7

1. **Normal indicator diagram.**
2. **Leaky or broken intake valve.**
3. **Leaky or broken discharge valve.**
4. **Discharge valve lift too low.**
5. **Intake valve lift too low.**
6. **Discharge valve springs too heavy.**
7. **Intake valve springs too heavy.**

Data for charts are entered by the chief station engineer or sometimes the machinist. Charles Rickey (left), chief station engineer at Service Pipe Line's Drumright (Oklahoma) station enters data. Charts have cut down on overhauls and breakdown of units.



Crankcase oil samples are gathered by Carl Bishop, machinist at the Drumright station. They will be sent to laboratory for analysis. Before charts were introduced, the machinists gathered the same information and recorded the figures. But charts give a more graphic picture of trouble brewing.

DIESEL ENGINE MAINTENANCE

How 'Health' Charts Can Aid

By CARL I. HUSS, Service Pipe Line Company, Tulsa

ON THE THEORY that an ounce of prevention is better than a pound of cure, Service Pipe Line Company has initiated an engine maintenance program designed primarily to do the following:

1. Reduce the number of emergency shutdowns and failures.
2. Reflect the results of changes in materials and methods.
3. Obtain optimum service of parts and equipment.
4. Indicate when engine failures might be expected and take steps to correct the situation.

An important factor in the program is its graphical presentation by means of charts which station engine personnel are required to fill out and keep up to date. It is felt that greater effectiveness is assured by graphs than by other forms of record.

The information required by the forms is the same as that required prior to the adoption of the present system, the essential difference being that by recording it graphically it is possible to get an actual picture of engine performance over extended periods.

Conditions governing engine performance change, sometimes fast but at other times so slowly that one is not aware of it. But, regardless of the rate of change, a graph will show it. Changes in a graph which are not

FIGURE 1—Figures lettered in the left hand column denote average limit of that factor. All charts are for the 1540-horsepower dual-fuel unit, designated as the No. 3 unit.

FIGURE 2—This record shows steady compression pressures of all cylinders throughout the year's operating time. The fact that the compression pressure did not decrease shows that no significant blow-by is taking place at the rings or valves. Bottom line shows how turbocharger output varied steadily with load requirements at top of Figure 1.

wholly accounted for by load, speed or atmospheric conditions can be interpreted as indicators regarding the functioning of some part of the engine. As examples: increasing exhaust temperatures may indicate a plugged turbocharger nozzle ring and further proof would be increased manifold pressure; worn or stuck piston rings may cause decreased filter life, low compression pressure and higher exhaust temperatures; a dirty oil cooler can

MAINTENANCE

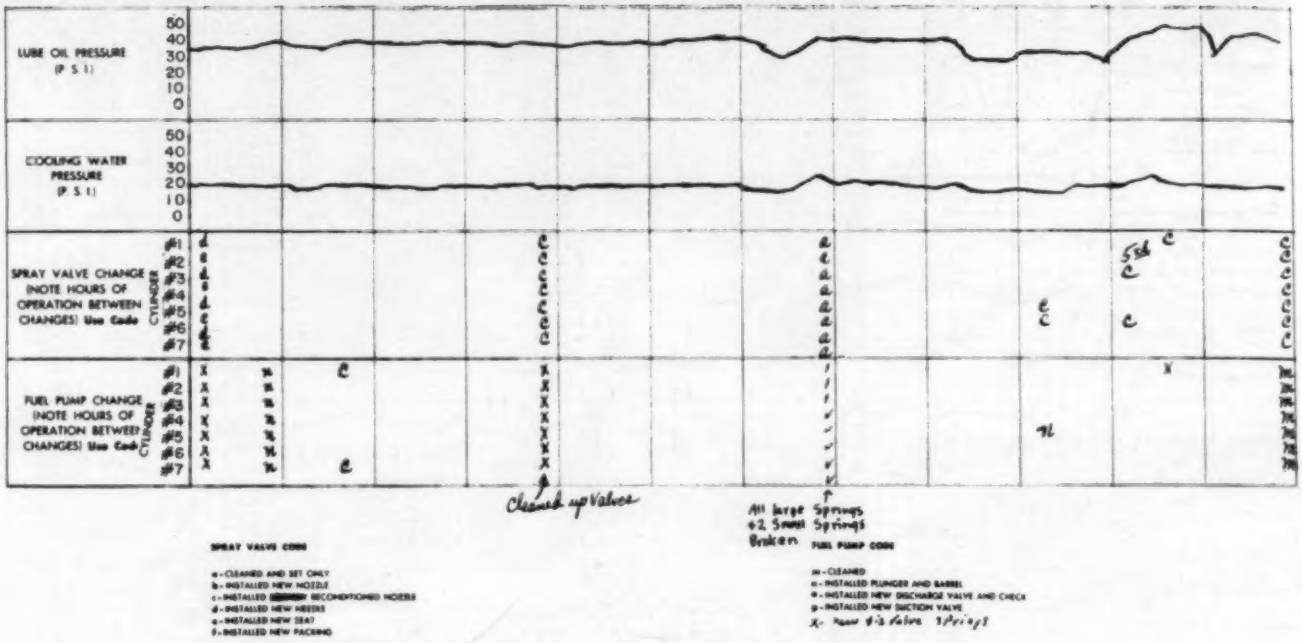


FIGURE 3—This chart shows all reconditioning of spray valves and fuel pumps; also lube oil and cooling water pressures. Graph shows normal operation of these engine auxiliaries throughout the year.

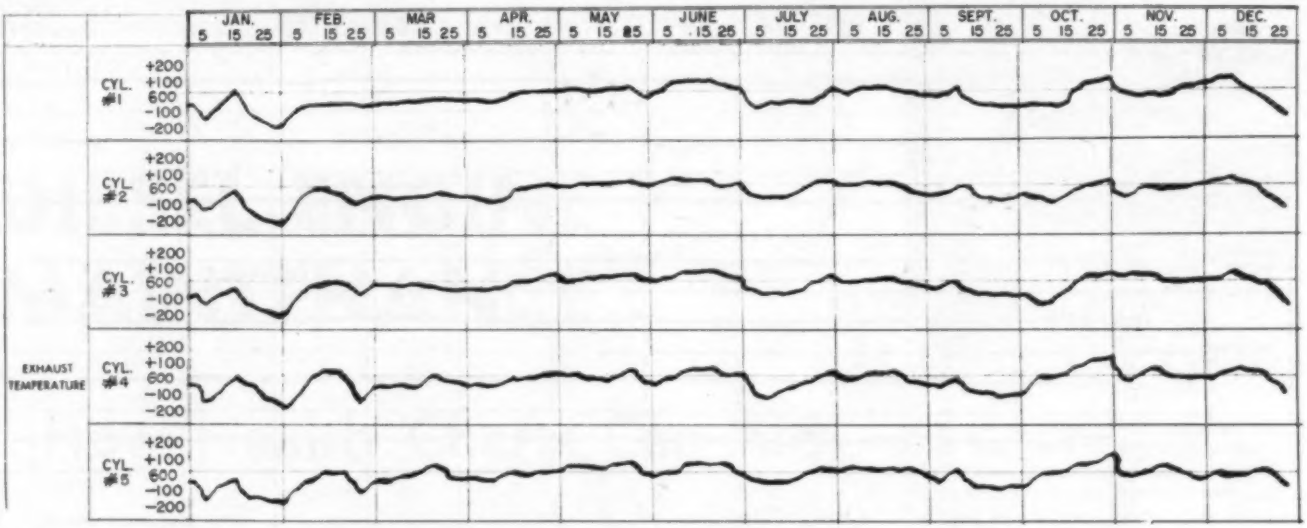


FIGURE 4—Fluctuations in graphs show normal changes of temperatures with load. Periodic abnormal conditions such as caused by bad injection equipment are not graphed because conditions are corrected and new condition graphed. Any corrections made to injection equipment are noted on chart shown in Figure 3.

be quickly found by noting the change in differential inlet and outlet oil temperatures, etc.

"The beauty of charting the information is that you can schedule your shutdowns for maintenance at your convenience," says Charles Rickey, chief station engineer at Service Pipe Line's Drumright, Okla., station. "On the other hand, when a unit breaks down you have to drop everything else and fix it right now."

Rickey says his engines haven't had one-tenth the shutdowns they had before the charts were introduced.

The charts save on overhaul costs, too. Machinists used to overhaul all engines every 6000 hours regardless. They now overhaul the engines when they need overhauling as indicated by the charts. As a result some engines have been running more than two and one half years now without an overhaul.

Tom Llewellyn, assistant master mechanic, and Ed Schuster, engineer, designed the set of graph charts. They allotted space on the charts for such information as firing pressure, exhaust temperature, compression pressure,

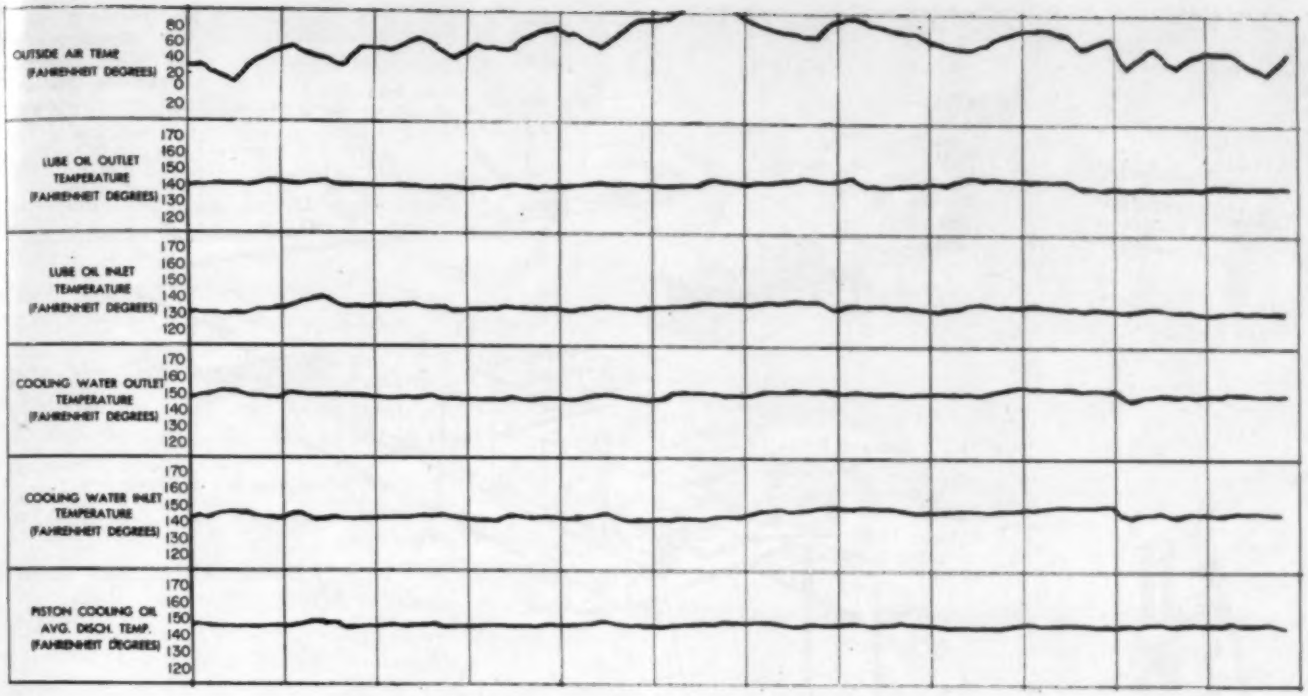

OUTSIDE AIR TEMP (FAHRENHEIT DEGREES)
LUBE OIL OUTLET TEMPERATURE (FAHRENHEIT DEGREES)
LUBE OIL INLET TEMPERATURE (FAHRENHEIT DEGREES)
COOLING WATER OUTLET TEMPERATURE (FAHRENHEIT DEGREES)
COOLING WATER INLET TEMPERATURE (FAHRENHEIT DEGREES)
PISTON COOLING OIL AVG. DISCH. TEMP. (FAHRENHEIT DEGREES)

FIGURE 5—This graph shows no abnormal conditions during the year.

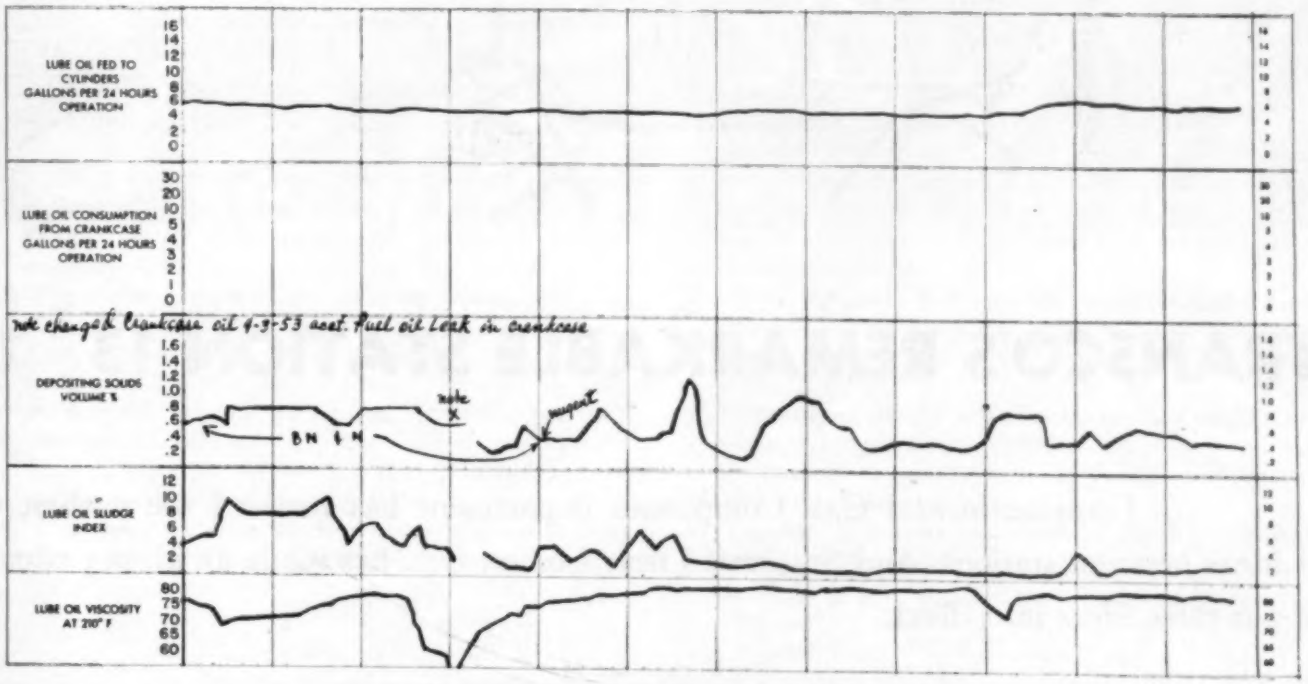

LUBE OIL FED TO CYLINDERS GALLONS PER 24 HOURS OPERATION
LUBE OIL CONSUMPTION FROM CRANKCASE GALLONS PER 24 HOURS OPERATION
DEPOSITING SOLIDS VOLUME %
LUBE OIL SLUDGE INDEX
LUBE OIL VISCOSITY AT 210° F

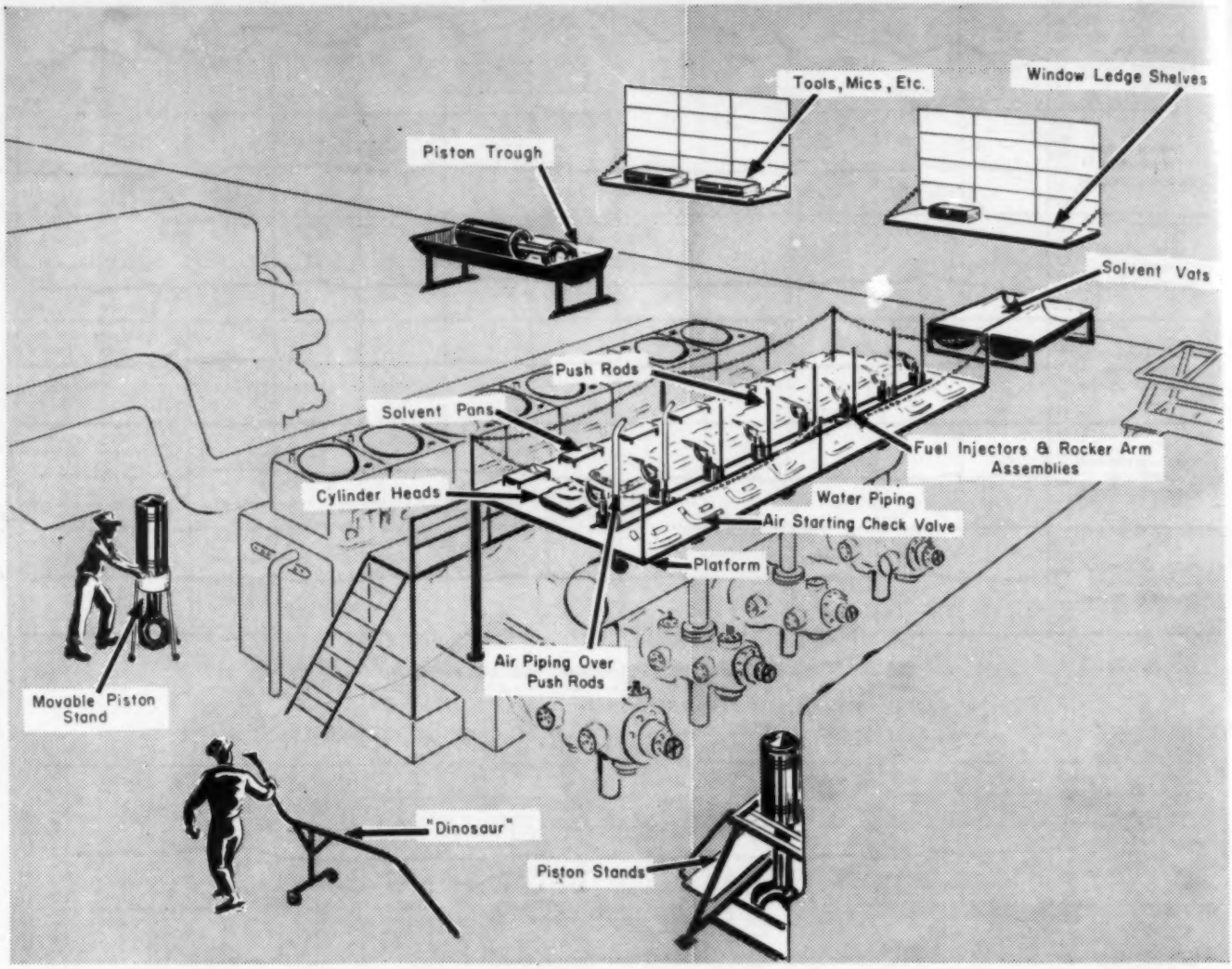
FIGURE 6—This chart shows record of lube oil condition for the year. Drop in lube oil viscosity during March was traced to small leak in fuel line. Normal viscosity curves for diesel engine lube oils increase slightly with usage of oil. Any drop in viscosity should be investigated thoroughly.

lube oil temperature, cooling water pressure and fuel pump replacements.

The accompanying charts are reproductions of actual charts maintained at Service Pipe Line's Drumright station for one year on one unit.

These charts indicate that a well-managed maintenance program can keep large diesels in first class operating condition with a minimum of necessary repairs and no unnecessary repairs. —**The End**

MAINTENANCE



TRANSCO'S REMARKABLE STATION 13

Transcontinental Gas' Compressor department has fostered the exchange of ideas between stations. And Station 13 near Comer, Ga., has made an all-out effort to put these ideas into effect.

By DONALD M. TAYLOR, Editor, PIPE LINE INDUSTRY

WHEN A VISITOR to Transcontinental Gas Pipe Line Corporation's compressor station No. 13, near Comer, Ga., remarks on the superstitious aspects of the station's numerical designation, the operators quickly set him straight.

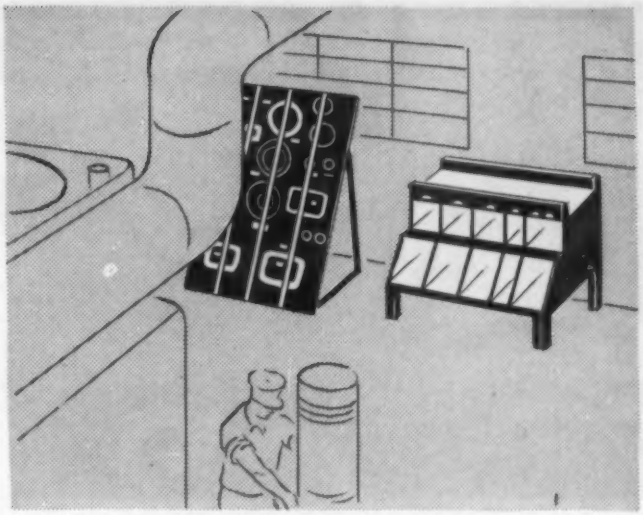
"The number 13 is lucky for us," he is told. "For instance, our last overhaul took only 13 days and 13 hours. And lucky things usually happen on the 13th day of the month. As a matter of fact, the station started operations on March 13, 1951."

But the luckiest thing of all is that the men at the station like their work. They are a mechanically inclined group whose interest in their jobs rivals the interest devoted to hobbies. They are always looking for new ways of doing things, and nothing pleases them better than upsetting an apple cart load of old ideas. The station forces are credited for several notable inventions.

A remarkable thing about the station personnel is that with the exception of Frank Graham, station superintendent, and Athel Wilson, his assistant, none of the men had had experience at a compressor station before No. 13

FIGURE A (left)—Annual overhaul is highly organized at Station 13. Note the portable platform which provides storage space for the upper part of engine.

FIGURE B (right)—Opposite end of the engine during overhaul. Note gasket board which contains complete set for one engine.



went into operation. For the most part the men were selected from the station construction forces on a basis of mechanical inclination. Some of the men are ex-automobile and tractor mechanics, etc.

Perhaps this is why the crew, now accomplished veterans in compressor station maintenance, is so adaptable to new ideas. When they hear of a new way to save time they discuss it, and if it seems practical, they add it to their ever growing store of streamlined maintenance practices.

Here are but a part of the many ideas which this crew has invented or copied from other stations.

Annual engine overhaul. Last year Station 13's availability factor was 99.3 percent with the largest part of the 0.7 percent downtime being accounted for in the 30-day inspection and annual overhaul. On the Transco system this overhaul takes place at all stations simultaneously with crews working around the clock. Because of the company's high load factor an engine off the line costs money. For this reason, all overhaul work at all stations must be highly organized.

This is certainly true at Station 13, and here is the general plan Frank Graham and his men follow:

1. **Make ready.** The floor surrounding the unit is covered with fiber board to protect it; the portable platform alongside the catwalk is erected and tools, etc., are assembled at specific points. A portable gasket board which holds the exact number and kind of gaskets needed for a single engine and compressor is filled and moved to the compressor building.
2. **The engine is cooled** by circulating cooling water for 20 minutes after ignition has been out.
3. **One crew strips the top of the engine,** placing push-rods, fuel injectors, etc. in special racks on the platform. (The ignition wiring has been revamped so it can be disconnected from the coils on the cylinder head in a matter of seconds.) The cylinder heads etc. are arranged as shown in Figure A.
4. **A second crew removes door plates** and stacks them in a small rack spotted between the compressors on the adjacent unit.
5. **The power rod bearing and wrist pin clearances are checked simultaneously.** Two magnetic base dial indicators are mounted on the piston rod against the piston skirt and one is mounted between the rod and a machined surface on the crankshaft with the piston at bottom dead center. A hydraulic jack mounted on a base which spans the cast-iron crankcase pushes upward on the bearing case. The lower dial reads the bearing clearance, and when this is subtracted from the average of the two upper dials the wrist pin clearance is determined.
6. **All pistons are pulled.** The rings are removed, and the ring grooves are cleaned. Before new rings are installed on the engine, they are checked for roundness with a light gauge which was fabricated at the station. This enables a repairman to detect even 0.001 out-of-roundness.
7. **Check the main bearings,** the compressor and scavenging air connecting rod bearings, and check crossheads and crosshead shoe clearances, wrist pin clearances, etc.
8. **Inspect the cylinder and all ports** for carbon deposits. Glaze is removed with a shop made glaze cutter and the cuttings are caught in a bag beneath the cylinder.
9. **Reassemble the engine.**
10. **Run for 15 minutes and check all bearings temperatures by feel.**

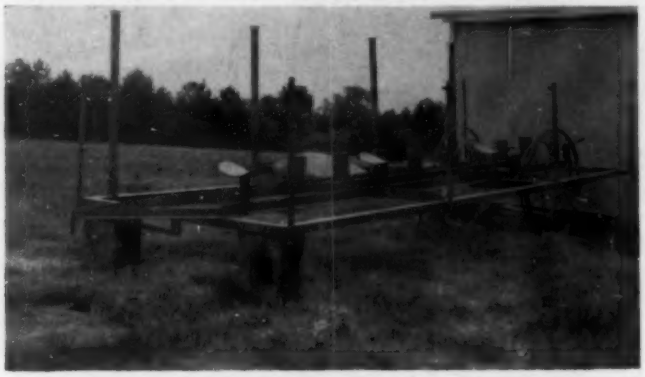
Continued on Next Page

Frank Graham, Transco's Station 13 superintendent, and his assistant, Athel Wilson, have emphasized that most of the ideas incorporated in this article did not originate at this station. Many came from other stations on the Transco system. Some of them came from other pipe line companies.

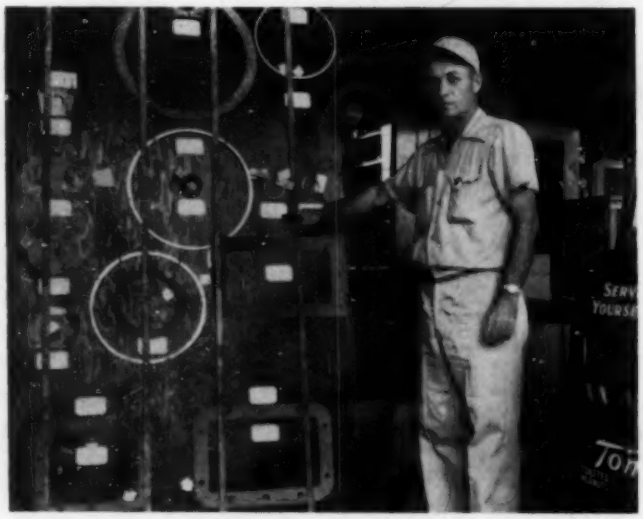
Transco's compressor department policy is to foster exchange of ideas between station superintendents through meetings and through drawings of good ideas. Yet each station superintendent is more or less free to choose his own maintenance practices.

The emphasis is on performance—not methods. All of the stations on the Transco system have good operational records. Last year the operational factor for the entire system was 95.3 percent and the availability factor for the entire system was 99.2 percent.

Special tools. At Station 13 such special tools as "devil's pitchfork" and the "dinosaur" play an important role in streamlining the operation. Here are some of the most important tools:

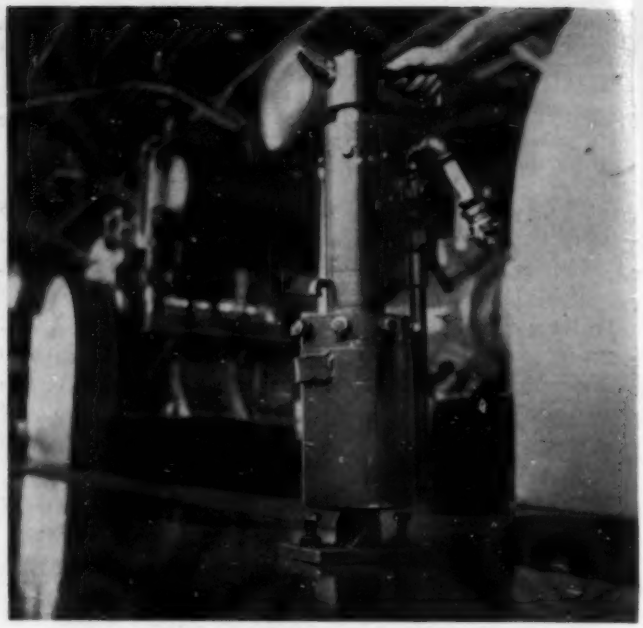


1. Portable platform for engine overhaul. Shown here stored in an upside down position is the platform which is mounted over the compressor bottles and alongside the catwalk. The floor is made of 2 x 12 timbers. An old fire hose cart was mounted beneath the platform to make it portable.



2. Complete set of engine gaskets on a portable board. Pointing to the card designation which shows kind of gasket and stock number is Athel Wilson, assistant compressor station superintendent. This board simplifies both accounting and maintenance. Note the light metal strips which hang from the top of the board to keep the gaskets in place.

3. Tool racks in the compressor basement. This space so often not utilized, provides a handy place to store maintenance tools.

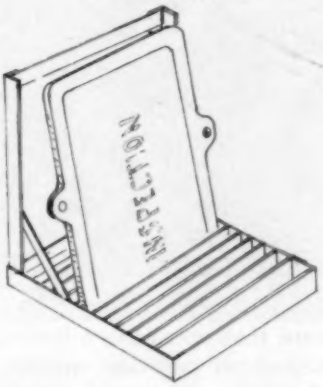


4. Shop made air jack for turning the flywheel. It operates on utility air and is mounted on a special base which prevents slipping, and also holds the two safety rachets which prevent the flywheel from turning when someone is inside the engine.

5. Piston rack inside the basement. Spare engine parts are stored near the trap door to the basement. This rack makes it possible for a single man to move a piston any place in the building.

6. "Dinosaur" used to lift main bearing caps. To remove power piston lower bearing caps, the station forces devised a brass tipped rod supported on casters outside the engine, which goes through the bolt holes and permits the caps to slide to the outside. The liners are rolled out and the bearings inspected.

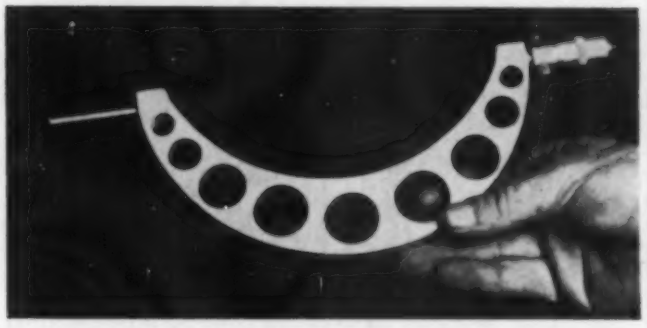
7. To remove the bearing liners, these hooks are threaded through the bearing caps and the liner is rolled around the crank shaft.



8. Inspection plate rack. All the plates are stored out of the way between the adjacent compressor cylinders.

9. The light gage for inspecting piston rings. This disc was machined to a 17-inch perfect circle. Before a piston ring is installed, it is compressed inside the 17-inch circle and examined with a light behind it. An out-of-roundness of 0.001-inch will show up. If the out-of-roundness exceeds 0.003, the ring is not installed.

10. Piston ring remover. This simple device spreads the ring to make it easy to remove.

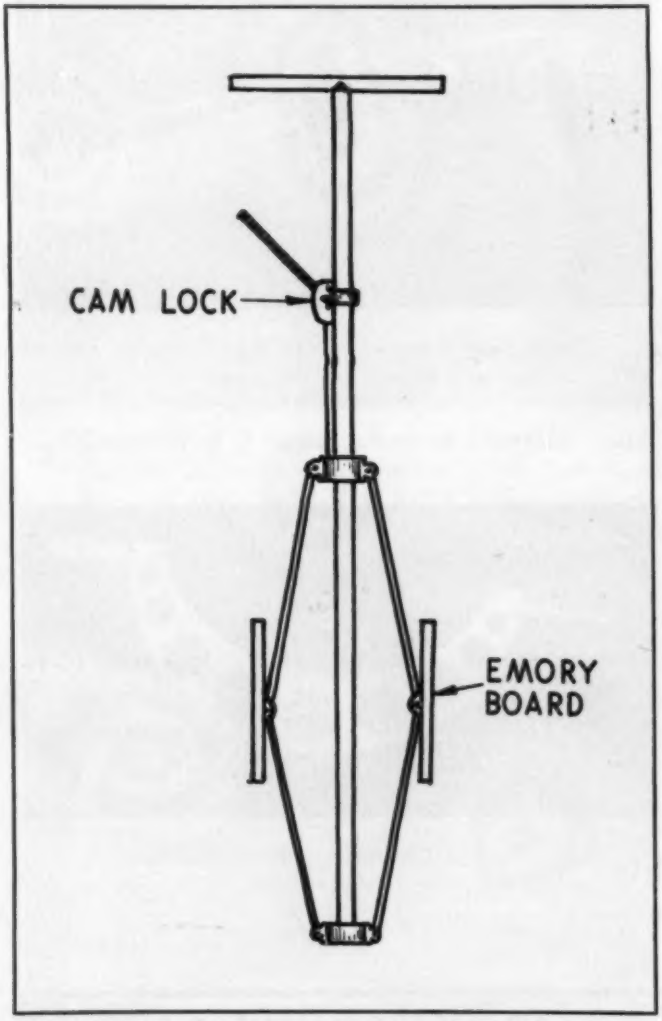


11. To "mike" the cylinder with the rod in place, this special micrometer was devised. The holes are for lightness.

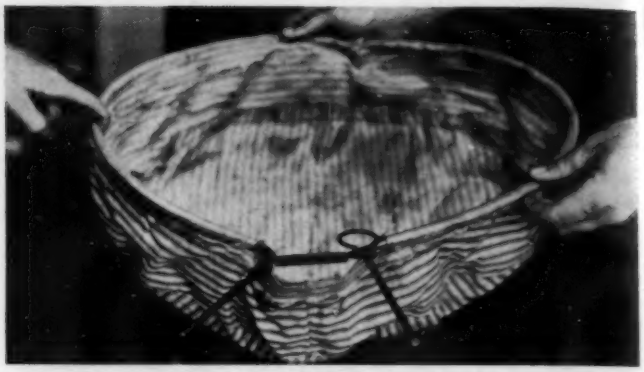
Continued on Next Page

MAINTENANCE

12. **Tool for "miking" power cylinders in port area.** One edge spans the port on one side of the cylinder, the other is on the land on the opposite side. Level bubbles are mounted at the top of each blade.



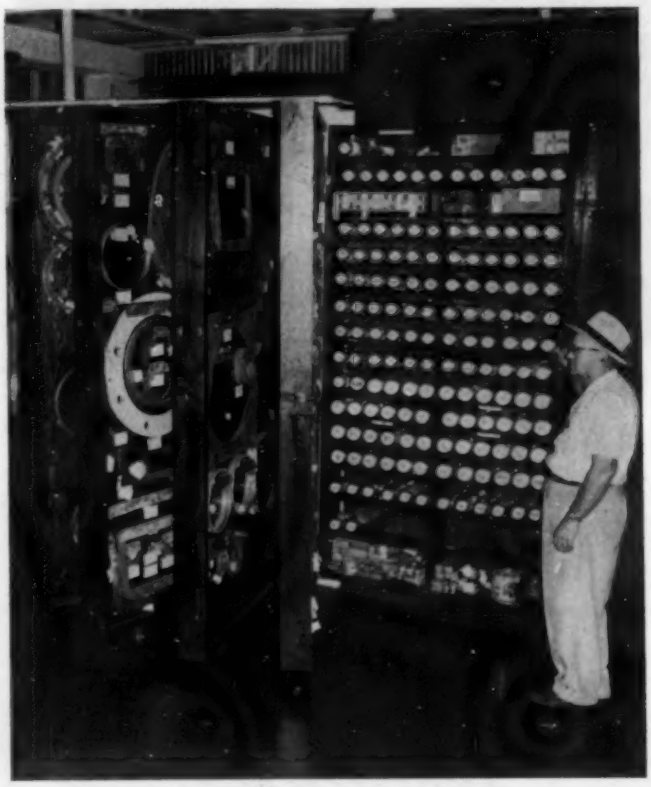
13. **Glaze breaker** for power cylinder.



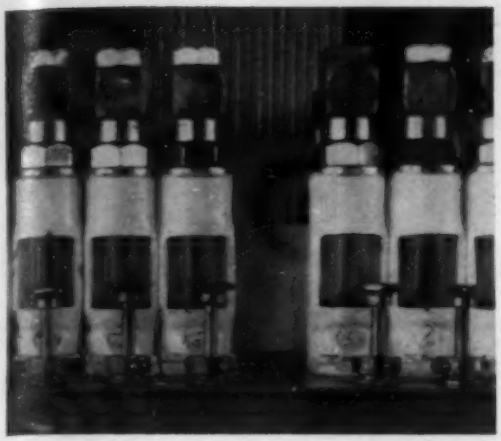
14. **When the carbon and glaze** is cleaned from the cylinder, this canvas bag catches the cleanings. It clamps beneath the cylinder.

Maintenance practices . . .

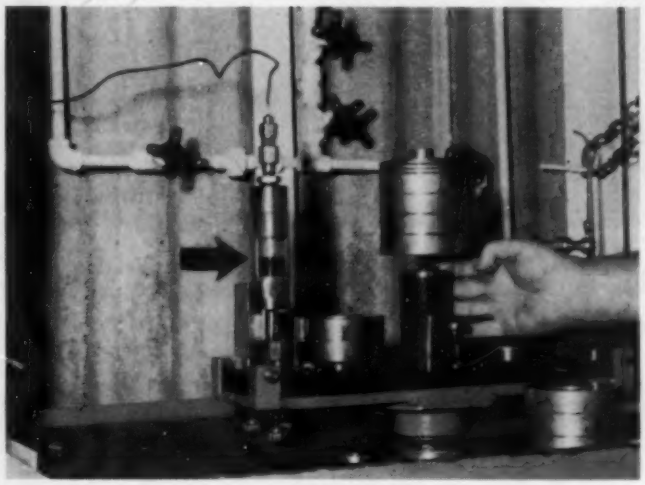
Here are some of the ways everyday station maintenance is made safer and easier at Station 13.



15. **Gasket board that opens like a book.** Thousands of gaskets, and small parts are stored in this novel board, which closes like a book when not in use. Note that all of the items are catalogued with station stock numbers. Shown here is station superintendent Frank Graham.



16. Bobbers make it easy to observe lubrication. All of the oil fed to the engines comes through the lubricators. As a matter of fact, instead of adding oil to the crankcase, oil is removed from them. The purpose of the sight feed glasses is to determine whether or not they are working. Usually this is a time-consuming task. The operator must watch each individual glass until he sees a drop of oil seep upward. But with the copper bobbers shown here, the entire bank of lubricators can be checked in a matter of seconds. Because for the oil to go upward, it must move the bobber upward.



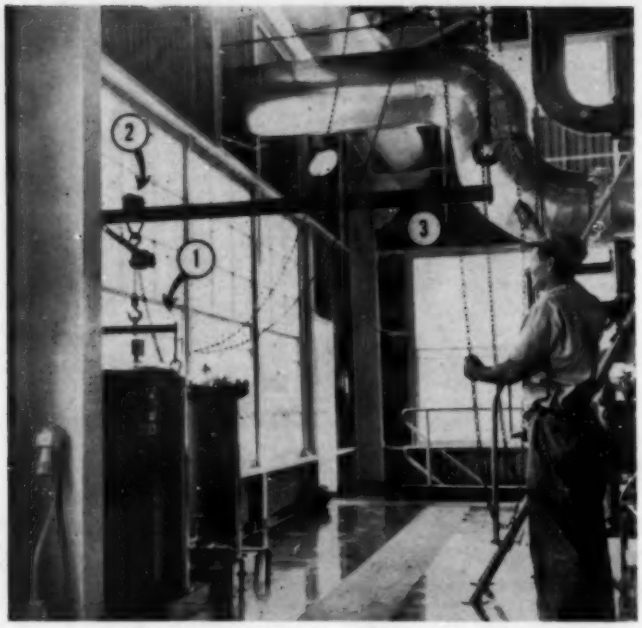
17. Sight glass for dead weight tester makes it safer. To insure the oil seal on the tester simply install a sight feed glass as shown. It makes it easy to check.

18. A card rack on each engine keeps maintenance program straight. On this auxiliary engine there is a card for each of the following: magneto, oil filters, spark plugs, inlet and outlet temperatures, generator and exciter, and miscellaneous.

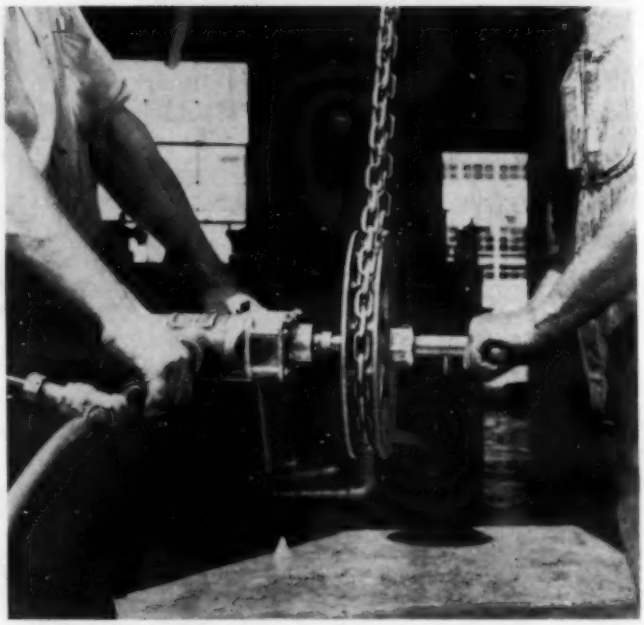
19. Chain on tachometer prevents damage. It's simple. But it has saved many a tachometer.

Continued on Next Page

MAINTENANCE

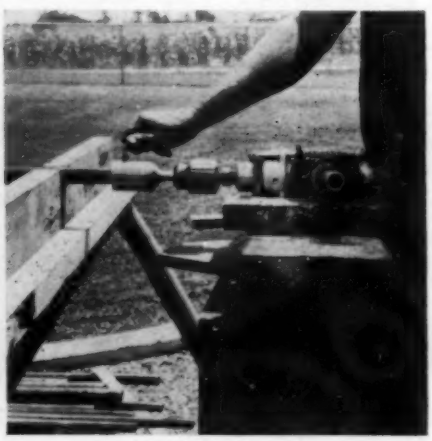


20. **How to move an oil filter to the chain hoist.** This is a ticklish job. More often than not, the chain hoist will not reach the filter on dead center, so the crew at Station 13 devised this method. The piece of pipe with a hook (3) at the end is fitted over a piece of rod welded to the building steel and supported by the chain hoist at (3). A coffin hoist lifts filter (1) and a trolley (2) permits the filter to be moved beneath the main hoist without sloshing.



21. **How to make an air hoist from an air drill.** To speed engine repairs the crew added this sprocket to an air drill and substituted it for an air hoist.

MAINTENANCE



22. **How to clean small pipe at high speed.** The problem was to clean several hundred feet of one-inch pipe. A fitting was made to clamp the pipe to an air drill and as the pipe rotated, a second man cleaned it with an air buffer.

—The End

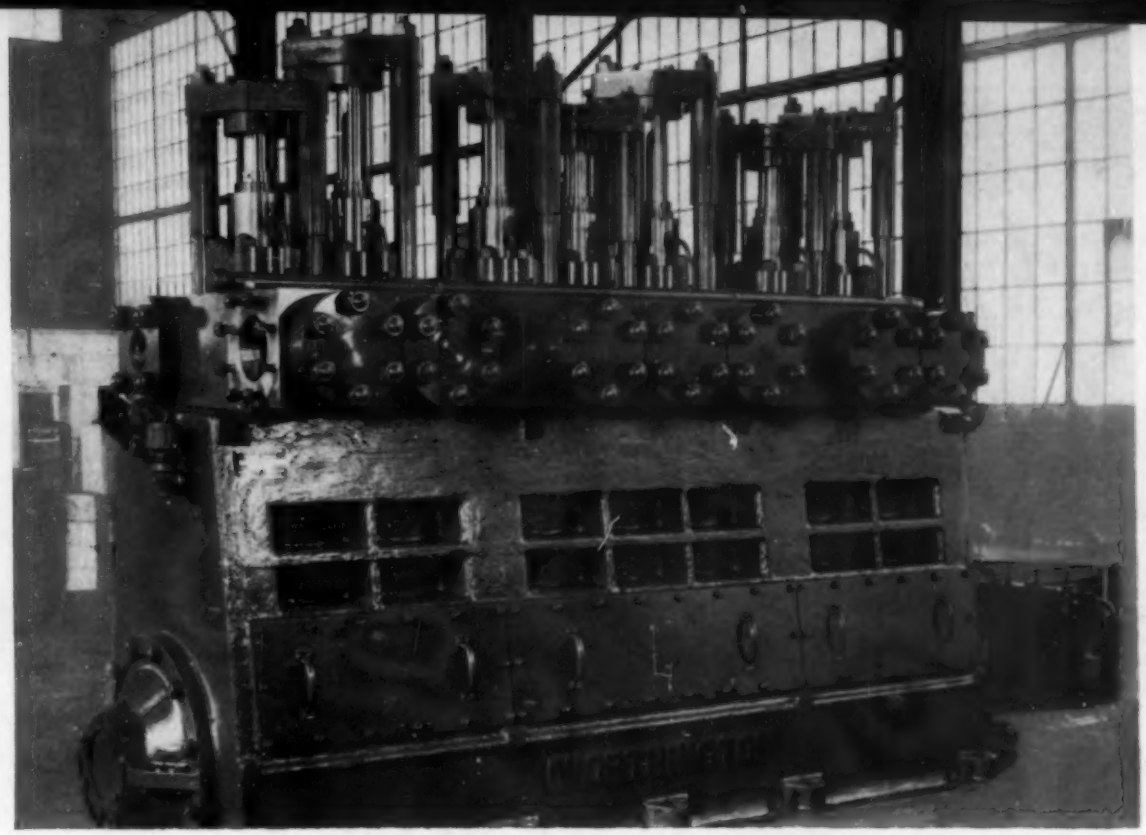


FIGURE 1

PIPE LINE POWER PUMPS

Maintenance to Suit the Construction Features

By R. K. GROBHOLZ
Manager, Reciprocating Pump Division,
Worthington Corporation, Oil City, Pa.

DIFFERENT TYPES of pumps may need different kinds of maintenance to suit the construction features of each.

Horizontal piston pumps for 60-80 revolutions per minute and pressures to about 500 pounds per square inch, are found on many smaller pipe lines. These "inside packed" pumps are less suitable for higher pressures; where "outside packed" plunger pumps allow packing leakage to be seen and adjusted while running. While many existing plunger pumps are of slow-speed horizontal or open-frame vertical style, recent trends have been to short stroke, higher speed, enclosed crankcase verticals (Figure 1). With driver, such pumps only take up one half to two thirds the floor space of slow-speed units.

Each has its own peculiar maintenance problems, according to the construction. Each requires different care, and a knowledge of one type does not necessarily make a man an expert on another.

HORIZONTAL PUMPS

Practically all horizontal piston and plunger pumps are built with an enclosed power end containing the crank or eccentric. Many power ends include reduction gearing. Lubrication plays an important part in guaranteeing against excessive wear of running parts. Before starting power pumps the first time, flush all bearings with kerosine to get rid of accumulated dirt.

Lubrication. With closed crankcase pumps, oil for running parts of the power end must also lubricate reduction gears. Compromise by using the heaviest oil that will flow freely to all points of lubrication. When starting up and running in pumps of this type, some prefer an E. P. lubricant to prevent pitting of the gears. At normal room temperatures, oil corresponding to SAE-40 is good. For warmer climates, use SAE-60.

Follow manufacturer's recommendations carefully in the amount of oil used. A lot of these pumps depend for lubrication on oil picked up by the main gear, so the oil level must be high enough to contact the lower curvature of this gear.

Yet, if too much oil is used, agitation will cause unwanted foaming. Excessive lubrication is to be especially avoided with anti-friction bearings, as high running temperatures will result. The pump illustrated in Figure 2 has splash lubrication, with an oil distributing system to pinion shaft bearings utilizing oil pressure generated at the mesh of the gears.

Piston rod stuffing boxes and plunger stuffing boxes may have bolted or screwed glands. The latter are more common on high pressure pumps. The power end stuffing box can generally be packed with square braided packing of the graphited asbestos type. Packing for liquid stuff-

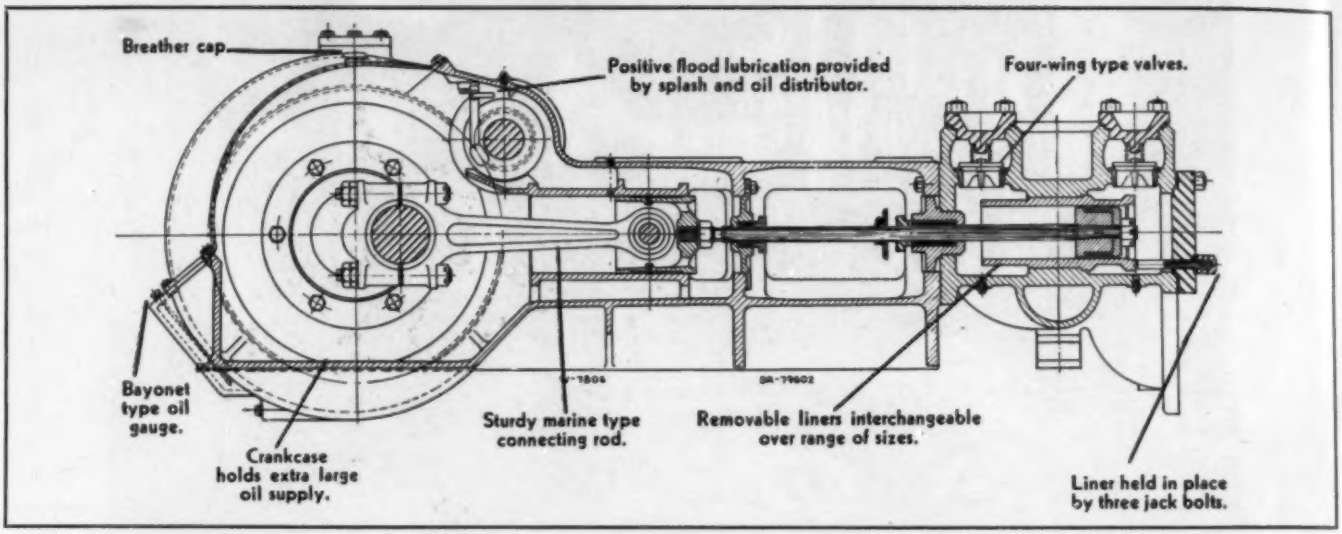

Breather cap.
Positive flood lubrication provided by splash and oil distributor.
Four-wing type valves.
Bayonet type oil gauge.
Crankcase holds extra large oil supply.
Sturdy marine type connecting rod.
Removable liners interchangeable over range of sizes.
Liner held in place by three jack bolts.

FIGURE 2

ing boxes depends upon quality of the oil pumped, its pressure and temperature. "V" style packings have become increasingly popular for higher pressures, since it takes fewer rings to hold a given pressure. Use only the number of "V" rings recommended by the packing vendor for the pressure; since too many rings will cause too much friction, with resulting damage to packing, rods or plungers. Use a filler piece to fill the rest of the packing space.

Packing comes in either split or solid rings. The rod or plungers must be removed to insert the latter. Never install spiral packing without first cutting it into separate rings. Install each ring individually, tamping it solidly against the bottom of the box. Use a split bushing of hard wood, if necessary, but never a pointed tool that could damage packing.

If split rings are used, stagger joints. If the pump has a lantern gland for packing lubrication, make sure it's positioned properly in the box, adjacent to the oil or grease inlet hole. With the box packed, tighten the gland to consolidate the packing, then back it off until only hand-tight. Watch for swelling as the packing gets wet, and loosen the gland if the box runs hot.

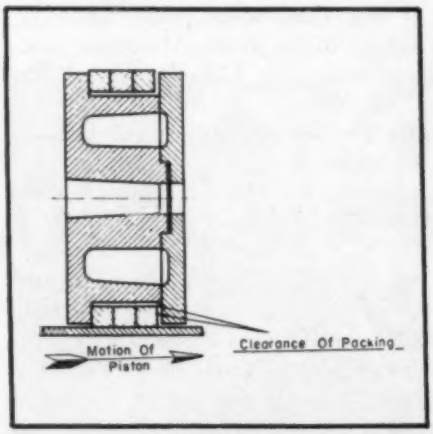


FIGURE 3

Cast iron ring packing is self-adjusting. Care must be taken if a body and follower piston like Figure 3 is packed with fibrous packing like Rockhard. As shown, it must "float" in the packing space. This allows oil under pressure to get behind the packing and hold it against the cylinder liner with no greater friction than absolutely needed to seal. Lateral play permits packing to shift back and forth as the stroke of the double-acting pump reverses. Fibrous packing that swells, or is clamped in place between body and follower, not only wears quickly, but also can badly score cylinder liners. *Some times it's a good idea to soak packing overnight before installing.*

Piston pipe line pumps are practically all of the side pot valve design like Figure 2, so that each liquid valve in its own chamber is individually accessible. Most use wing-guided valves with a beveled seating surface that is self-grinding. If necessary to remove valve seats that are pressed-in on a taper fit, the taper is usually great enough to permit removal with a threaded puller.

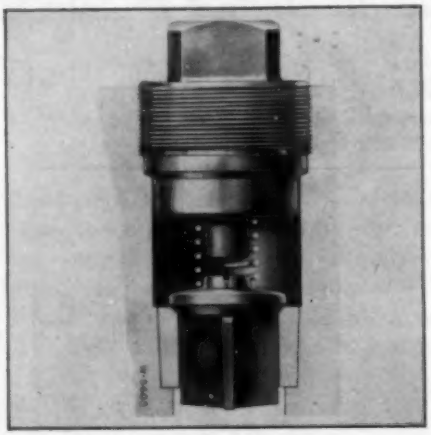


FIGURE 4

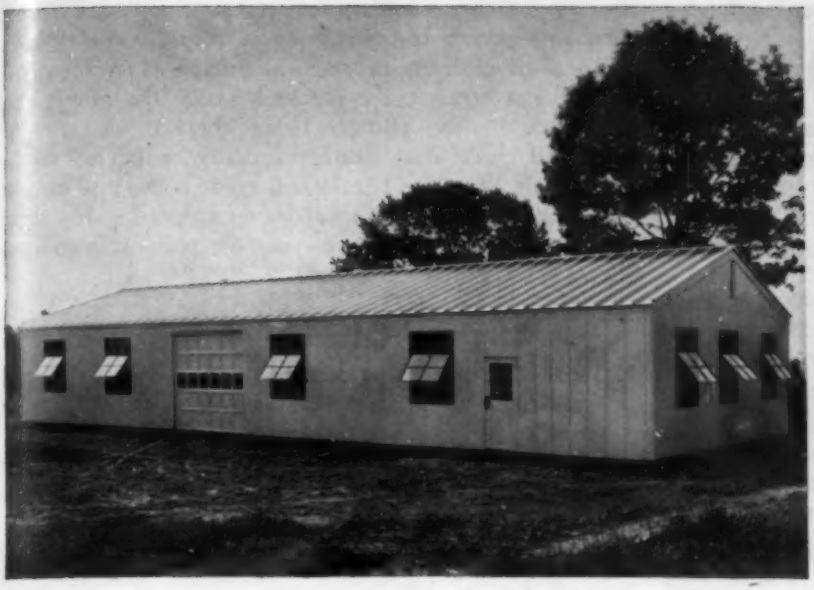
Pressure pump valve service can still be of the wing type, but is necessarily more complicated. One common design in Figure 4 has a ground metal-to-metal high-pressure joint between the valve plug and the cylinder. Unless the threaded valve cover is strongly sledged home with a striking wrench, leakage at this joint can wire draw the cylinder to the point where an extensive overhaul is needed.

The slight taper on these valve seats causes them to fit tightly, and a threaded puller will rarely remove them. Pump manufacturers will provide special tools for use in conjunction with hydraulic, center-hole jacks; which make short work of this job.

VERTICAL PUMPS

The higher speed of modern vertical pumps like Figure 1, makes pressure lubrication of the power end desirable. As a rule, these pumps use a separate lube oil pump, geared to the crankshaft, for developing necessary oil

MAINTENANCE



Armco Steel Buildings Give You...

Economies of Standardized Construction Plus Variety of Size and Layout

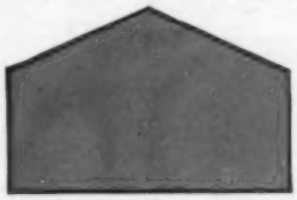
You can get the cost-saving benefits of standardized construction PLUS a wide choice of sizes and arrangements that make it easy to meet your specific needs. Whether you need a weather-tight warehouse or meter station—or an economically heated office, you'll find the practical answer in Armco Steel Buildings.

STEELOX Panel construction makes it possible! The 16-inch wide panels lock together to form sturdy walls and roof. Floor areas are practically unlimited—from 20 square feet up. A wide variety of doors, windows and other openings can be conveniently located where you want them.

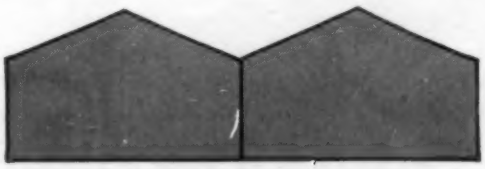
Armco STEELOX construction saves time and money too. Erection is quick, easy. You save framing, rafters, sheathing and roofing, because the panels provide both structural support and finished exterior. Workmen need no special training to do a fast, efficient job.

Write us for details about versatile Armco Steel Buildings. Armco Drainage & Metal Products, Inc., 4645 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

Clear-span widths up to 12 feet.



Clear-span widths up to 40 feet.



Any number of clear-span bays to provide almost unlimited width.

ARMCO®

ARMCO STEEL BUILDINGS

For more data on advertised products, use Readers' Service Cards, last page.

pressure. Oil picked up from the crankcase is fed through the crankshaft to crank and crosshead pin bearings and to crossheads and guides by means of rifle-drilled passages.

As with horizontal pumps, the power end must be clean before oil is added; and the quantity should closely follow manufacturer's recommendations. Oil companies suggest the use of high quality, turbine stock, lube oil having rust and oxidation inhibiting additives. For normal atmospheric temperatures of 40° F. to 110° F., combined with liquid pumping temperatures of 60-120° F., use an oil of 300-600 SSU viscosity at 100° F. Change oil after one month's operation. After that, twice a year should be enough unless the pump is outdoors or in a dusty location. Then change once a month.

Follow the pump builder's instructions as to oil pressure. Most lube oil pumps have an adjustment for this. Shut down the pump immediately if the oil pressure gauge doesn't register, and locate the cause.

The mechanics of packing the stuffing box of a vertical pump are the same as for horizontal machines. Be sure plunger alignment is not disturbed. If it is, plungers must be re-aligned in accordance with manufacturer's instructions. A few shots of oil on the packing when installing and before starting will help break in new packing.

If the interior of a new pump has been coated for corrosion protection, clean it thoroughly with a solvent; particularly the valve service.

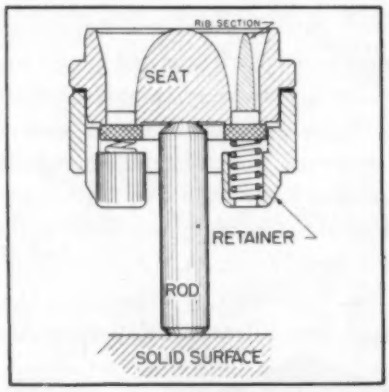


FIGURE 6

Removing liquid valves for vertical pumps. A majority of these pumps have double-ported ring valves with an assembly like that in Figure 6. Valve, seat and spring retainer come out as an assembly, and can be taken apart on a workbench in the manner shown.

Re-assembling and installing the valve cartridge. The disc must be centered in the guides and compress the springs. If cocked or hung up on the guides, damage will result. If seat and retainer do not fit tight enough to stay together, try using 3 or 4 spots of paint on the circumference of the joint like glue. Replace valves in the same position as before removing. If the suction valve cartridge is put in backwards, the pump can't fill. If the discharge cartridge is reversed, the pump can break when started against a blocked discharge.

Valve seating surfaces must be absolutely free of any nicks or notches to get rated capacity. If possible, reface when necessary on a grinding machine and then lap. Otherwise, lay a sheet of fine emery cloth on a flat surface, and carefully rub the seat on it. Inspect valves after the first 400-500 hours' operation. Conditions determined then will govern the frequency of future inspections.

To align plungers on vertical pumps as in Figure 5, remove the crankcase cover and wedge the power end crosshead for the plunger being checked, against the crosshead guide that would normally be loaded if the pump were running. The loaded guide is the one toward which the crank pin is traveling after passing top dead center. Use calipers to make sure the plunger is concentric with the stuffing box bore.

MAINTENANCE

HELPFUL HINTS

1. **Start power pumps without load.** Starting torque then is only 25 percent as compared with 150 percent for a loaded pump. This last figure can be a lot higher with a stiff, new pump. Play safe and install a hand bypass back to suction. Keep it open until the pump gets up to speed.

2. **Relief valves are a must for power pumps.** A blocked discharge will do serious damage to the pump or driver. Set it to pop at 10 percent over the maximum working pressure.

3. **Plenty of available NPSH** (net positive suction head) is the best insurance of a satisfactory power pump. Be sure and provide what the pump builder advises—don't try to skimp. And remember—high viscosity greatly increases NPSH required. If viscosity is too great, heat the oil to bring it down.

4. **Most pipe line power pumps** (particularly the verticals) are sold with suction air chambers. They not only reduce pulsation, but also may reduce required suction pressure. Keep these chambers charged with air. One full of oil is useless. Buy a discharge cushion chamber if the discharge pipe vibrates excessively.

5. **If the pump fails to deliver capacity,** check for—insufficient speed, insufficient suction head, air leak in suction or stuffing boxes, piston or plunger packing worn, pump valves worn or hung up, bypass not closed, internal gaskets damaged.

6. **If the pump won't deliver pressure,** look for—piston rings worn, bypass open, driver too small, suction valve hung open, pump vapor bound.

7. **If the pump vibrates abnormally,** look for—unsupported piping, poor foundation, misalignment.

8. **A noisy pump can be caused by**—poor suction conditions, valves hung up, broken valve spring, loose or damaged bearings, crosshead clearance excessive, burned out connecting rod bearing, misalignment, foreign solids in pump, loose side rod nuts.

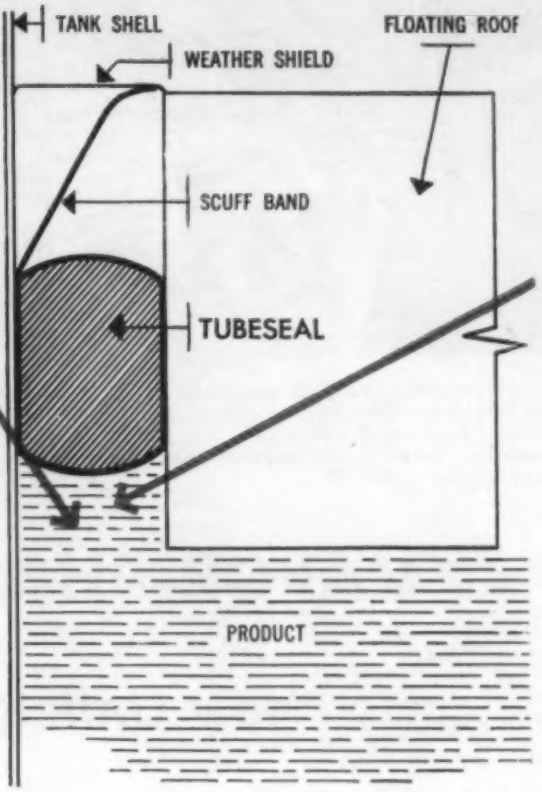
The best guide to proper maintenance are the instruction books supplied by pump manufacturers. Don't lose them! Read them thoroughly, especially before starting a new pump.

In spite of power pumps being all their manufacturers can make them, breakdowns will happen. Don't risk a shutdown while repair parts are ordered, built and delivered. Order spare wearing parts with each new power pump.

The pump supplier will be glad to recommend which parts you should carry. —**The End**

THE SECRET OF A GOOD FLOATING ROOF:

NO ROOM FOR VAPORS*



*NO EVAPORATION
NO FIRES
MINIMUM CORROSION

Because there is no space in a HAMMOND TUBESEAL FLOATING ROOF, where vapor can form, jet fuels and other volatile products can be stored with assurance that evaporation and fires cannot take place and further that corrosion will be kept to a bare minimum.

THE HAMMOND TUBESEAL

The most efficient and positive seal known: no moving parts · no mechanical maintenance · climate proof · non-corrodible · can operate to bottom of tank or above the top · no vapor space below the seal · entire circumference has tight seal under pressure at all times.

LICENSES AVAILABLE

The makers of TUBESEAL believe that its unique safety and economy factors should be allowed to benefit the broadest possible section of the petroleum industry. For that reason HAMMOND IRON WORKS will license its use on a non-exclusive basis. For further information write to:

HAMMOND IRON WORKS,
Warren, Pa.

ask for Bulletin TS

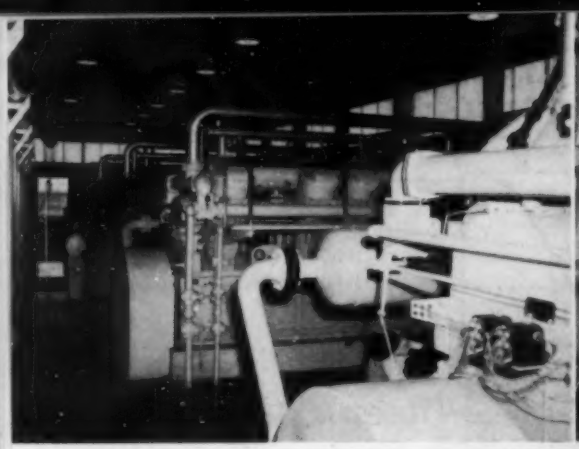
Sales Offices:
NEW YORK 20
AKRON
BOSTON 10
BUFFALO 2
CHICAGO 3
CINCINNATI 2
CLEVELAND 15
EL PASO
HOUSTON 2
LOS ANGELES 14
PITTSBURGH 19
RICHMOND 20
SAN FRANCISCO
WASHINGTON 6, D.C.
HAVANA
MEXICO CITY
"TIPSA" BUENOS AIRES
Licensee in Cal.:
LACY MFG. CO.,
LOS ANGELES
Licensee in Canada
BRIDGE & TANK CO.

HAMMOND TUBESEAL* COSTS NO MORE IN THE FIRST PLACE

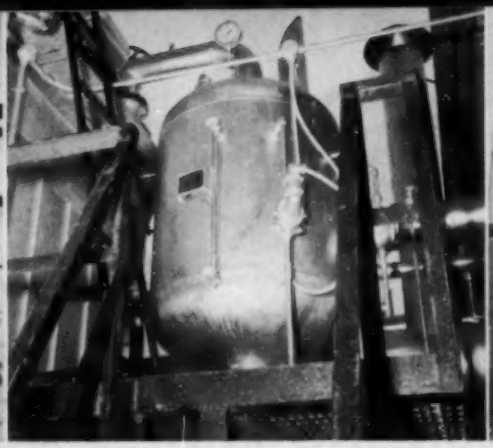
* Patent applied for

CHEAPER OVER THE YEARS

HAMMOND
IRON WORKS
WARREN and BRISTOL, PA. • PROVO, UTAH
CASPER, WYO. • BIRMINGHAM, ALA.



United Gas Pipe Line applied vapor-phase cooling in these five 880-hp engines when the Agua Dulce station was expanded. Now, with some operating "bugs" worked out, conversion of older engines is planned.



Water and steam from each engine flows into this vapor-phase unit. Steam passes through a series of baffles and out the top to the air condensor. Water returns by gravity to the engine.

Steam overhead from the vapor-phase separator is condensed by this air cooled unit. An operator regulates the speed of the fan by controlling the hydraulic system driven by the engine.

VAPOR-PHASE ENGINE COOLING

How United Gas Makes It Work

By C. D. LONG
United Gas Pipe Line Company

THE MOTIVATION behind United Gas Pipe Line Company's decision to apply vapor-phase cooling to gas compressor station operation at its Agua Dulce, Texas, station was:

- **To reduce waste heat from gas engines by converting it to useful work.**
- **To take advantage of the probable benefits of such cooling to overcome problems arising from adverse engine fuel.**

So far as conversion of the waste engine jacket heat into steam was concerned, the promise was better than the fulfillment. Plans to utilize engine jacket steam to drive atmospheric cooling fans was shelved temporarily because suitable low-pressure, low-horsepower steam turbines were not available. Hydraulic drives were substituted instead.

But other benefits were realized. The Agua Dulce compressor plant was in the heart of a depleted sour gas field. If the engines could tolerate the hydrogen sulfide, this gas could provide low cost source of fuel. It was felt that vapor-phase engine cooling with its even, high temperature could minimize crank case sludge and acid and reduce over-all engine maintenance costs and make the use of this fuel feasible.

Actual application of the vapor-phase cooling system was started in 1953 at this station where there were already four Ingersoll-Rand, eight-cylinder, type SVG 440-horsepower engines in operation. Additional horsepower was needed at the station and it was decided to install five additional Ingersoll-Rand type 82KVG-880 hp engines—each driving two 10¼-inch by 14-inch compressor cylinders. Ingersoll-Rand was advised of these plans in advance of the purchase of the engines and it was decided to make the following changes in design in piping from the conventional water-cooled type KVG engine:

1. **Provide one 8-inch steam manifold for the engine.**
2. **Install additional 1½-inch outlets from each cylinder head to the steam manifold.**
3. **Use the conventional jacket water pump for oil cooler service.**

These changes were correlated between Ingersoll-Rand and Engineering Controls Inc. by United Gas' Engineering department and plans completed for this installation in the year 1953.

On January 2, 1954, these five engines were individually broken-in by operating 24 hours with no load, 6 hours with ½ load and 6 hours with ¾ load. Through this break-in period no unusual conditions were noticed in the operation of any of the engines by engineering personnel from all three companies involved in this project.

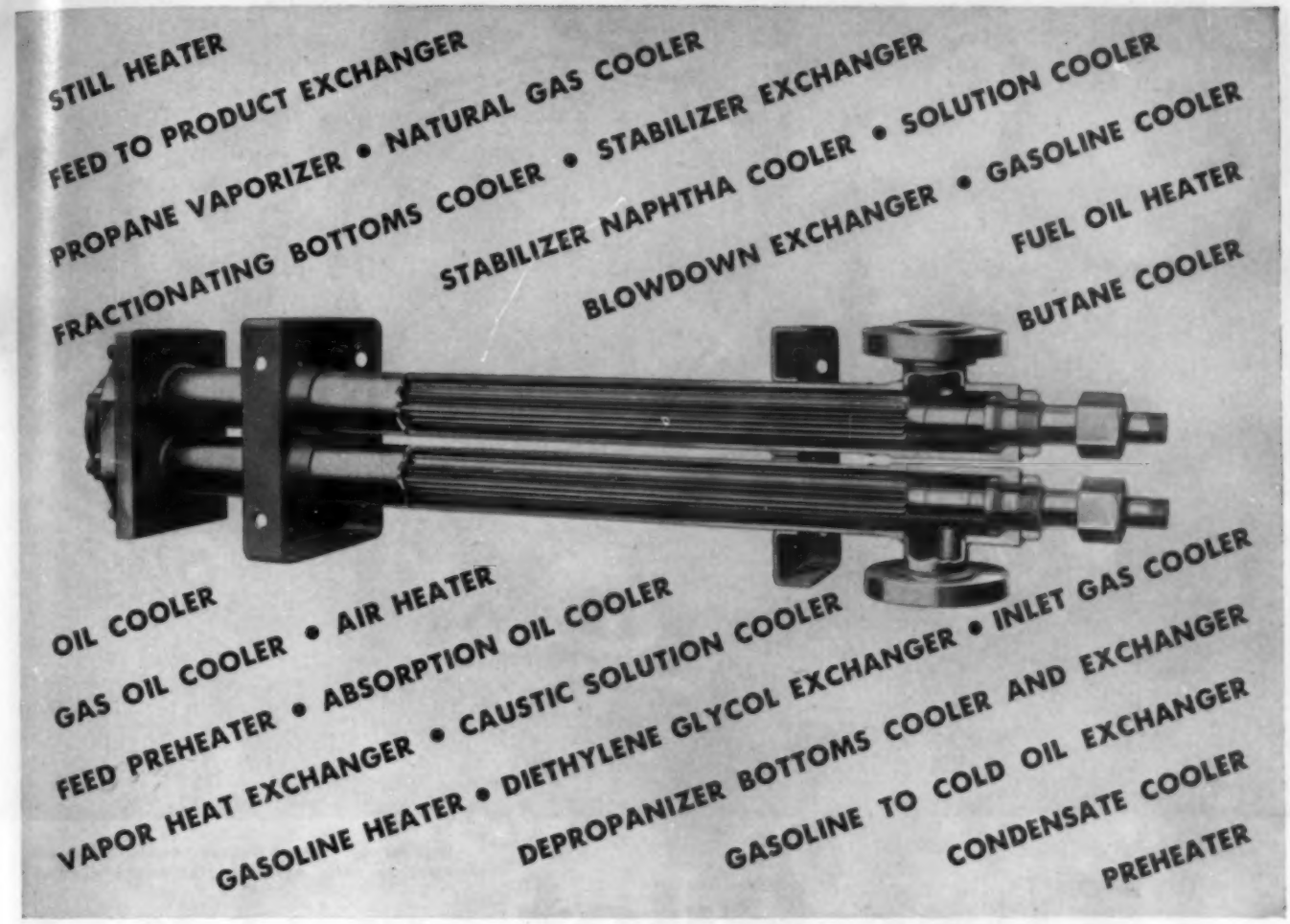
Initial operations of these five units was started on January 5, 1954, with the following approximate conditions:

1. Suction 425 pounds per square inch gage, discharge 685 psig, R = 1.6
2. Delivery—100 M³/Day
3. Jacket water in 209° F.—out 212° F.
4. Oil in 140° F.—oil out 165° F.
5. Speed—330 revolutions per minute
6. Manifold depression—9½-inch Mercury
7. Fuel consumption—8.2 cubic feet per bhp-hr.

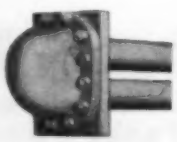
The operation of these engines was watched closely and diligently around the clock by both the operating company personnel and the manufacturers of the equipment.

To properly understand the events of the following several months, it is necessary to list them in the chronological sequence.

1. **January 8, 1954,** three days after starting, light to medium power cylinder knocks were noticed in all five engines. These knocks were most prevalent and noticeable on the left bank of cylinders, that is cylinder No. 1 through 4.
2. **January 9 to January 14, 1954,** cylinders were inspected and wear


STILL HEATER
FEED TO PRODUCT EXCHANGER
PROPANE VAPORIZER • NATURAL GAS COOLER
FRACTIONATING BOTTOMS COOLER • STABILIZER EXCHANGER
STABILIZER NAPHTHA COOLER • SOLUTION COOLER
BLOWDOWN EXCHANGER • GASOLINE COOLER
FUEL OIL HEATER
BUTANE COOLER
OIL COOLER
GAS OIL COOLER • AIR HEATER
FEED PREHEATER • ABSORPTION OIL COOLER
VAPOR HEAT EXCHANGER • CAUSTIC SOLUTION COOLER
GASOLINE HEATER • DIETHYLENE GLYCOL EXCHANGER • INLET GAS COOLER
DEPROPANIZER BOTTOMS COOLER AND EXCHANGER
GASOLINE TO COLD OIL EXCHANGER
CONDENSATE COOLER
PREHEATER

Proved by 350,000 Years of Service

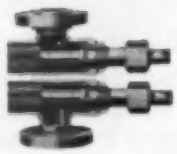


DOMED SHELL COVER—an exclusive Twin G-Fin Section feature provides streamlined return flow

More than 70,000 installed G-R Twin G-Fin Sections with an average operating period of well over 5 years have totaled a length of service which far exceeds that of any other sectional design of heat exchanger.

And what has this unique record demonstrated? It has conclusively proven the effective design and lasting construction of these units, originated by Griscom-Russell more than 25 years ago. It has also shown that the Twin G-Fin Section is the *universal* heat transfer apparatus—operating with complete success as a cooler, heater, condenser and heat exchanger for a wide range of fluids. And it has provided Griscom-Russell with an unequalled experience and wealth of performance data that assure the most authoritative recommendations and reliable ratings on this type of unit.

Write for Bulletin 1400 describing the G-R Twin G-Fin Section in detail.



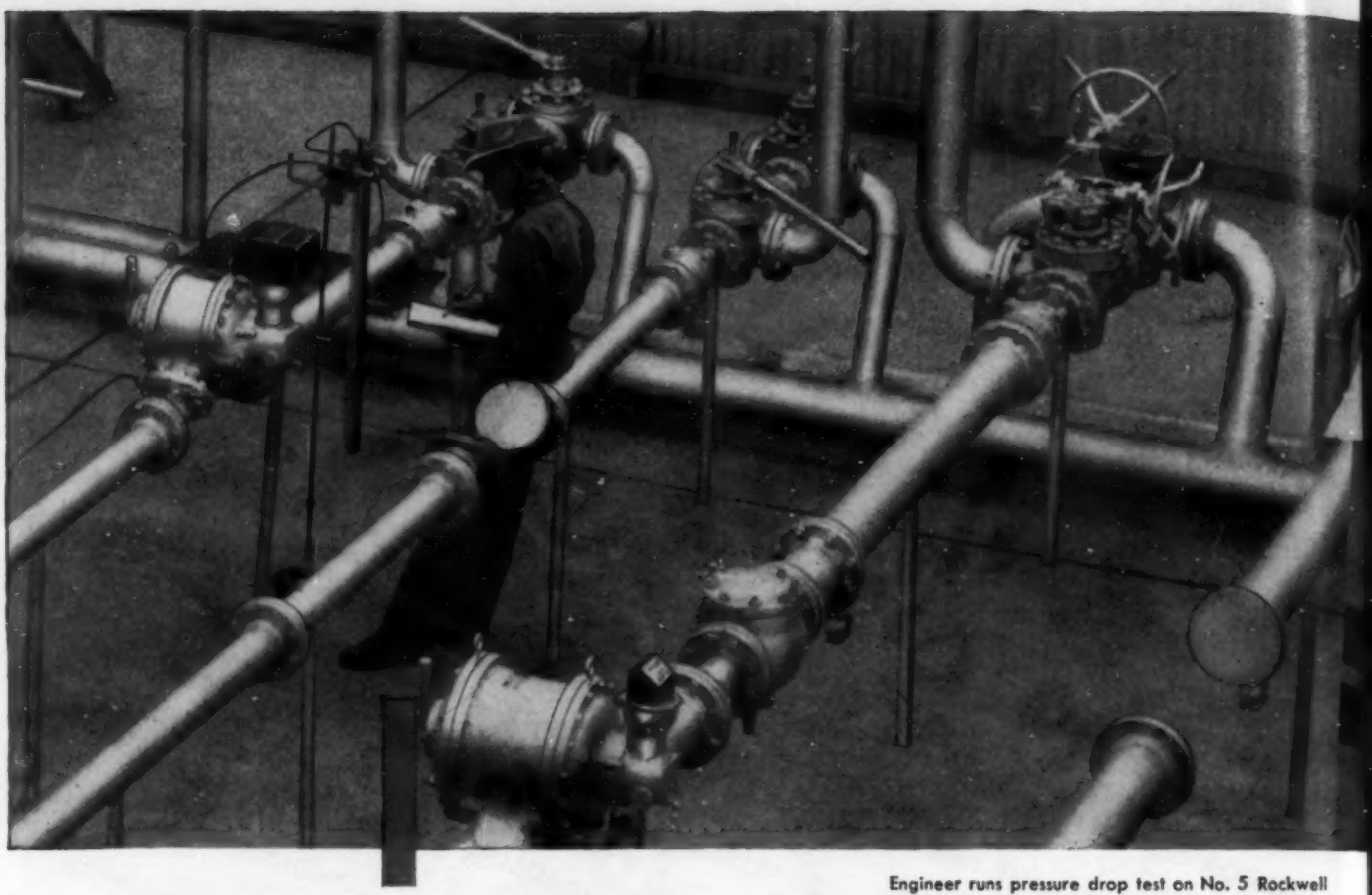
3-PART END CLOSURE—an exclusive feature of Twin G-Fin Sections—far superior and simpler than in any other design of sectional unit

G-R
HEAT TRANSFER APPARATUS

THE GRISCOM-RUSSELL CO.
MASSILLON, OHIO
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

Twin G-Fin Section ...

For more data on advertised products, use Readers' Service Cards, last page.



Engineer runs pressure drop test on No. 5 Rockwell Rotocycle meter measuring high octane gasoline.

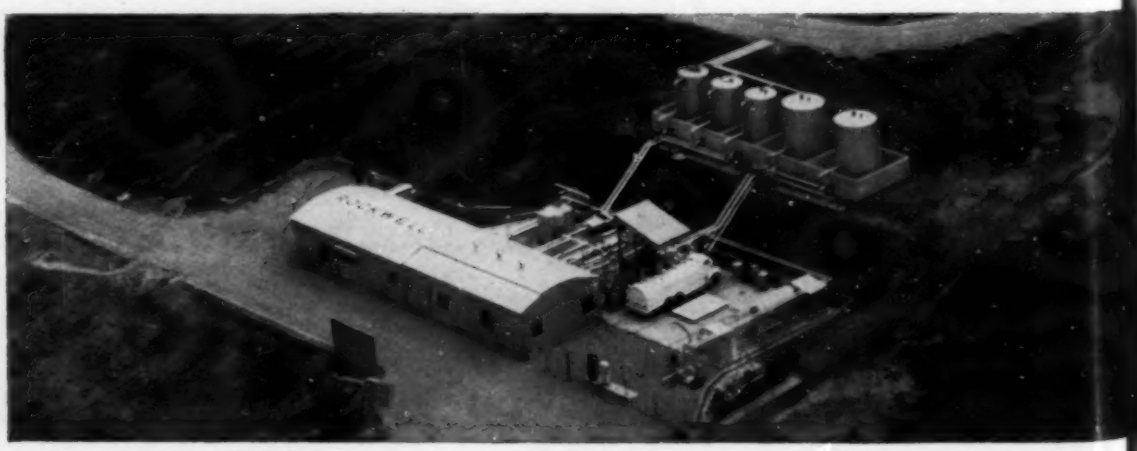
Test Pilot with his feet

in the new Rockwell test station . . . a Rockwell contribution to

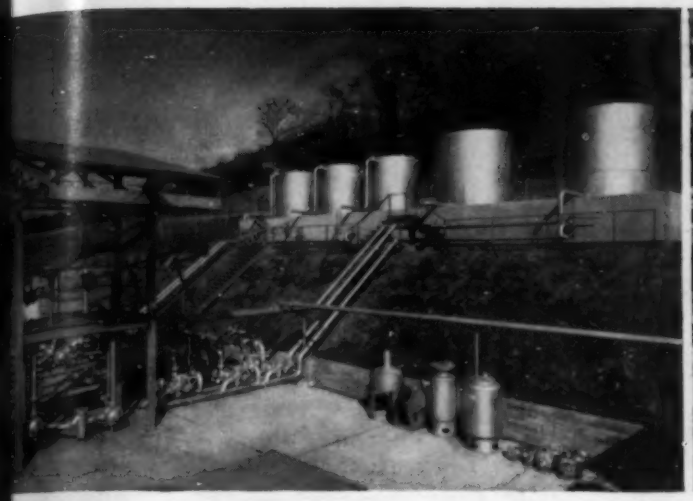
Here We Test Meters Under Every Conceivable Operating Condition, Torture And Abuse Them To Pre-Prove Their Accuracy And Durability.

The result? You know for sure that every Rockwell meter will precisely measure the liquid specified and withstand stresses and strains far above any normal expectancy. Just to make sure, we built a four-acre proving ground and equipped it with every modern device for meter testing. Here Rockwell engineers can put their many years of meter making experience to work—subjecting meters to any and all field operating conditions.

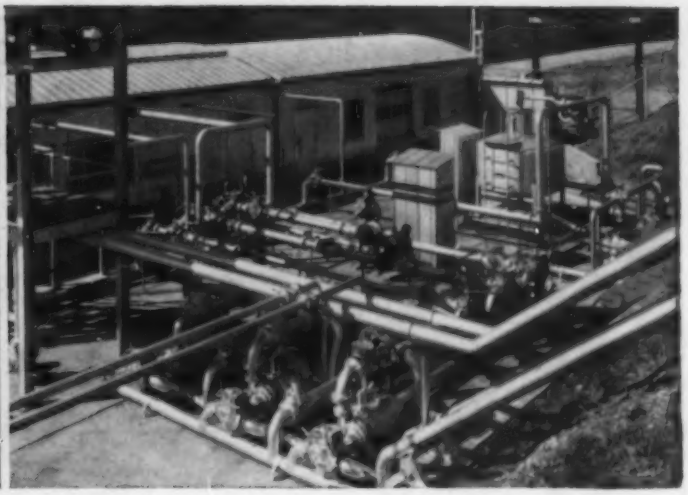
Such exacting research rewards Rockwell meter users with a superior degree of meter accuracy and performance. We invite you to inspect this unique testing plant which is unequalled anywhere in size, equipment and scope of operations.



Aerial view of new Rockwell testing station equipped with every facility for meter proving, research and development.



Storehouse for better meter performance Five large storage tanks are provided to permit testing meters on gasoline, fuel oil, bunker "C", sweet crude and sour crude respectively. Loading rack with remote registration units at left is used to fill Rockwell tank truck on which truck meters are road tested.



World's largest petroleum meter test station View of operations area from storage tank level showing in foreground the combination of three pumps which together permit testing meters at flows of several thousand gallons per minute. Building in background houses indoor proving room, remote registration facilities, tool room and maintenance shop.

on the ground

better measurement

Rockwell *ROTOCYCLE* Meters

YOU CAN REALLY ROCKWELL RELY ON ROCKWELL

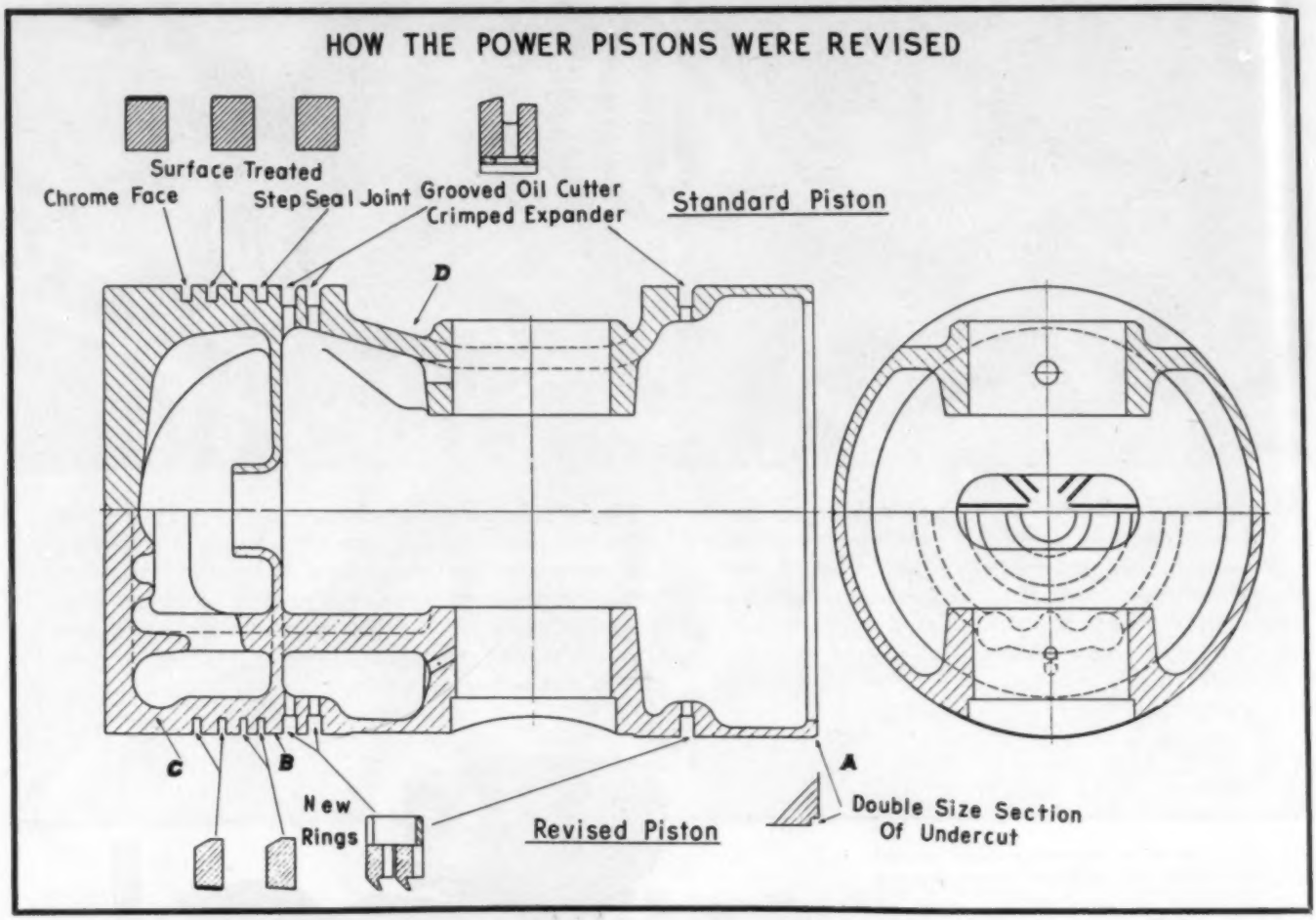
The meter with the All-Revolving "Flo-Ward" Design

Rockwell Rotocycle meters have the benefit of an exclusive operating principle in which all the working parts revolve on ball bearing mounts and turn with the flowing stream. The movement is identical to that of an electric motor and equally free. This superior construction pays off in speedier meter deliveries, less wear and longer mechanical life. A full line of models is available for pipeline, loading rack, and industrial services. Write for catalogs.

ROCKWELL MANUFACTURING COMPANY PITTSBURGH 8, PA.

Atlanta Boston Chicago Dallas Houston N. Kansas City, Mo. Los Angeles New York Philadelphia Pittsburgh San Francisco Seattle Tulsa

Canadian Gas & Oil Products Sales: Peacock Brothers, Limited



measurements taken as rapidly as possible by the operating personnel.

3. **January 15 to September 2, 1954,** a complete changing of cylinders, pistons, and rings was accomplished.
4. **January 18, 1954** a conference was held on the site by the designers, manufacturers and operators.
5. **January 22 to January 29,** cylinder and water temperature checks were made throughout one engine.
6. **February 5,** identical temperature checks were made on a conventionally cooled engine of the same type.
7. **February 11 to July 7, 1954,** chemical analysis and hardness tests were run on original liners, pistons and piston rings.
8. **August 16, 1954 to January 18, 1955,** complete cylinder inspections were made on engines after 3000 hours of operation by individual engines.

The inspection of January 8, 1954 showed scuffing, scoring, scratching, galling and extreme wear in most of the cylinders. One cylinder had a wear of .017 inch after 33 hours of operation. Naturally this called for radical modification and maintenance measures.

The first step was to remove ring No. 7 from the skirt of all pistons to assure lubrication in all cylinders. Further, it was decided to change the crank case oil in No. 6 engine from 30 weight to 40 weight.

Next a complete analysis was made of oil from each crankcase. In order to keep at least four engines on the line while the fifth was receiving the modifications already decided upon, a decision was made to use an oil additive. This additive contained molybdenum disulfide.

All of these steps were taken with the greatest speed possible and a second inspection of No. 5 engine was made January 19, 1954. It showed a slight decrease in the wear rate. Though the wear continued, the decrease in rate was encouraging.

Seemingly there were points of heat concentration in the cylinder jackets and free thermal flow was hindered by the two jacket baffles. The first step was to place 1 by 1½-inch notches in both these baffles every 90 degrees around the cylinders. An additional 1-inch jumper was installed between the top of the jacket and the bottom of the cylinder head.

Meanwhile the engine manufacturer had designed a new style piston for this engine with ¼-inch ring grooves instead of 3/8-inch grooves, with better heat control and dissipation. The pin cavity had been removed from each side of the piston. These new pistons were to be furnished by Ingersoll-Rand on an emergency basis, and the operators were quite willing to accept and try them. Complete and exhaustive temperature checks would be made throughout the cylinder heads, cylinder jackets, and liners of one engine. As quickly as this could be done, the results were to be compared to identical readings from a conventionally cooled engine. Also the idea of running a chemical analysis and hardness test on liners, pistons and rings was advanced by the operator.

The results of these modifications and analysis were gratifying once the work was complete. The removal of the No. 7 oil ring did not noticeably increase the oil consumption. Neither did it visibly affect the operation in any way. The change from 30 to 40 weight oil in engine No. 6 was written off as an experiment without favorable results and the oil in this engine

Why tie up your money in communications equipment?

When you let the Bell System furnish your communications, you enjoy three important advantages:

1. *You avoid a large capital investment.*
2. *You don't have to worry about maintenance and obsolescence.*
3. *You get the benefits of trained personnel, expert supervision, continuing analysis.*

You don't tie up your money in communications equipment when you use Bell System facilities. This means you free this money to produce income.

A Bell System communications engineer will be glad to survey your communication needs. His study and recommendations are yours without cost or obligation. Call your Bell Telephone representative.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS

For more data on advertised products, use Readers' Service Cards, last page.

was soon changed back to conform with the others.

Laboratory analysis of the oil was not indicative of lubrication failure, oil break down or a gain or loss in viscosity. The use of oil additive with molybdenum disulfide we believe allowed continued operation of these engines during the cylinder modifications without complete engine failure. (This is a conclusion drawn though there is no proof of such because one engine was not operated without this additive. Neither is it intended as an indorsement of that or any product mentioned here).

The temperature checks provided one of the most interesting phases of this entire operation. (Up to the date of February 1, 1954 this work was classed as experimental.) Cylinders No. 3 and 7 of engine No. 9 were selected for this test. Fifteen thermocouples were inserted in each of these cylinders and the results read with a 20 point potentiometer. Four thermocouples were placed in the cylinder head water with two above and two below the head baffle. Three thermocouples were placed in the cylinder jacket water with one each above, between, and below the two jacket baffles. Liner metal was drilled ¼-inch deep inside the V at 45 degrees with the shaft 7 - 11 - 13 and 20-inches from the top of the liner and thermocouples inserted and sealed off. The remaining thermocouples were installed in similar locations outside the V 180 degrees around the liner.

The jacket baffles in No. 3 cylinder were notched every 90 degrees around the jacket while No. 7 cylinder was left with the standard factory notches. Both of these cylinders had the 1½-inch auxiliary outlet installed below the head baffle. With this thermocouple and piping arrangement, this engine was placed under a normal load and trial temperatures taken as indicated:

	No. 3 Cyl.	No. 7 Cyl.	Difference
Jacket Water	213° F.	214.6° F.	1.6° F.
Liner Metal	213.9° F.	219.1° F.	5.2° F.

The above temperatures indicated a heat congestion or a bottle neck in the jacket system. Accordingly, the 1½-inch auxiliary outlet on the No. 7 head was placed above the baffle and with an engine load varying from 92 percent to 115 percent full load, a series of ten temperature recordings was made at 15 minute intervals. The average of these temperatures is:

About the Author

C. D. LONG received a degree in mechanical engineering from Texas A & M College in 1934. From 1934 to 1939, he was with the Engineering department of the York Corporation at Houston. He joined the Engineering department of United Gas Pipe Line Company at Shreveport in 1940 with special duties in compressor station and pipe line construction. In 1950 Long was transferred to the Compressor Station department of United Gas Pipe Line. He is now assistant superintendent of that department. He is a Registered Professional Engineer in Texas

	No. 3 Cyl.	No. 7 Cyl.	Difference
Jacket Water	214.1° F.	218.4° F.	4.3° F.
Liner Metal	216.1° F.	219.2° F.	3.1° F.

It must be remembered that these temperatures rose to this point from an inlet water temperature of 209° to 210° F. so that the maximum temperature rise across these cylinders was only 10° F. Therefore, with the knowledge that these temperatures were elevated and the corresponding temperature rises were normal, it was concluded that perhaps there was a considerable temperature gradient between the cylinder skin and heat transfer surface. The thermocouples were removed from the liner and reset within ¼-inch of the cylinder surface. However, the maximum temperature recorded at this distance from the cylinder was 228° F. which certainly could not be considered abnormal when compared to the inlet temperature of 209° F.

Identical tests were run on cylinders of a conventional liquid cooled type KVG engine which normally runs with 150° F. water on and 160° F. water off the jackets. Measured temperatures at this location were only 60° to 65° F. lower and because the water to these cylinders was normally only 60° below the water to the vapor-phase engine jackets, it was concluded that this was a problem of only two parts; namely, to increase thermal circulation or to procure liners, pistons, and rings of metal compatible at the operating temperature. A combination of these was of course possible.

It had already been decided to notch the cylinder baffles, install the auxiliary outlet above the head baffle and use the new style Ingersoll-Rand pistons. To alleviate thermal circulation, it was decided to install an additional 1-inch jumper from the top of the cylinder jacket to the bottom of the cylinder head on all engines.

No chemical analysis nor any hardness tests had been made on any of the metals now showing severe wear. Accordingly, samples of worn liners, pistons and rings were sent to three reputable testing laboratories. At the same time Ingersoll-Rand was requested to furnish their specifications on these materials. Reports from these laboratories were very similar in every detail and the average hardness of the materials from these reports is shown below:

Brinell Hardness of Liners.....178
Brinell Hardness of Pistons.....196
Brinell Hardness of Rings.....199

Final corrective maintenance steps were now in order. The manufacturer had been advised of the findings by the laboratories and was instructed to furnish enough new liners for one of the five engines. A second set of new liners was ordered from a concern recommending a Brinell Hardness of 230 minimum. As previously stated pistons of a new design were to be installed in all engines. New piston rings were to be installed on all engines also. It was felt that of the 40 cylinders on these engines, enough of them could be salvaged to place good cylinders on the remaining three engines.

As the material arrived, engine No. 5 was equipped with new Ingersoll-Rand pistons and liners. Because sufficient replacement rings were in stock to equip this engine, these new pistons were specified to have the standard 3/8-inch ring grooves. Engine No. 6 was equipped with new liners having a 230 Brinell hardness, new style pistons and new narrow rings. Engine No. 7 received salvaged liners from other engines, new style pistons and rings. Engine No. 8 was equipped with liners rebored to 1/32-inch oversize, new pistons and new rings. Engine No. 9 was treated the same as engine No. 7 with salvaged liners and new pistons and rings.

With this work completed the sta-

Here's how they KO'd SULPHUR, CHEMICALS SALT AIR and HEAT on this Refinery Pipe line!

1. It takes no special equipment to apply Pitt Chem. Here, applicators brush on 101 about 12 mils thick.

2. Pitt Chem applies easily, even on awkward underside. Crew learned to apply it in a few minutes.

3. Pitt Chem 101 was economical to purchase and apply. It will protect this line against corrosion for years.

MAINTENANCE engineers at this Southwestern refinery realized that no ordinary coatings could protect these pipelines from the metal-eating conditions they faced. Today, the lines are safely protected with an impervious film of *Pitt Chem*® Tar Base Coating, the material that *naturally* resists practically all major types of industrial corrosion.

Pitt Chem Tar Base Coatings are tailor-made for protecting oil producing and refining equipment against corrosion. They are highly resistant to petroleum products as well as mineral acids, alkalis and moisture. They are economical to buy and easy to apply.

No other material does such a complete job of protection at so little cost. That's a big statement, but our corrosion engineers have the facts to prove it.

If you have a corrosion problem—and never mind how tough it seems—contact us today. You may be surprised how quickly and economically it can be solved.

PROTECTIVE COATINGS DIVISION
PITTSBURGH COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

WAD 5485

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

For more data on advertised products, use Readers' Service Cards, last page.

AND NOW—

Copon

in TRANSCO'S "SUPER INCH"

Long sections of Transcontinental's new 36-inch loop are coated with Copon Internal Pipe Coating for efficient delivery of cleaner gas

Here are the simple, factual reasons why more and more transmission lines are using COPON:

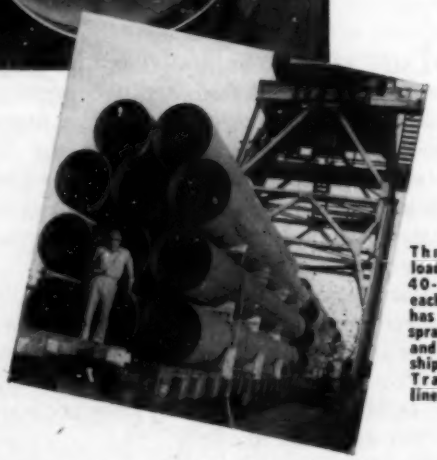
1. Proven protection against corrosion.
2. Complete internal protection of pipe during stockpiling, transportation and laying of line.
3. Reduced cost of using scrubbers and strainers.
4. Cleaner gas delivery greatly reduces maintenance and labor costs.
5. Over the years COPON saves many times its cost.

Our technicians can give your corrosion engineers, and others in your company responsible for obtaining most efficient operation, detailed evidence of Copon's exclusive characteristics.

This Coupon is for Your Convenience in Getting More Copon Facts Pronto!

Rows of 36" pipe, destined for Transco's "Super Inch" line, as it is rolled from Consolidated Western Steel Company's Orange plant to Rossen-Richards' yard where it will be chemically cleaned and sprayed internally with Copon, the effective corrosion control coating.

Close-up showing how pipe is pressure-sprayed with Copon at Rossen-Richards yard in Orange, Texas. Pipe is rotated as automatic sprayheads are slowly pulled through entire 40-foot length of pipe.



Three flat cars loaded with eleven 40-foot joints each. This pipe has been Copon-sprayed internally and is ready for shipment to the Transcontinental line.

Please send me information about COPON Internal Pipe Coating.

Name_____

Company_____

Position or Title_____

Address_____

City_____ State_____

Copon is manufactured under an exclusive franchise by a select group of companies, strategically located to serve U. S. industry efficiently. Write the company nearest you for details of technical services and specialized product formulation available.

ALLIED PAINT MFG. COMPANY
P. O. Box 1088, Tulsa, Okla.

ENTERPRISE PAINT MANUFACTURING COMPANY
2841 South Ashland Ave., Chicago 8, Illinois

COAST PAINT & LACQUER CO.
P. O. Box 1113, Houston 1, Texas

tion was carried on a full load basis as dictated by demand and it was decided that unless an emergency arose, no further inspection or changes would be made until the individual engines reached 3,000 hours of operation after modification.

The No. 5 engine was the first to reach this 3000-hour period and was inspected with the following results.

Cyl. No.	1	2	3	4
Wear	.009"	.005"	.005"	.004"
Cyl. No.	5	6	7	8
Wear	.004"	.004"	.005"	.004"

The average wear of .0016-inch per 1000 hours was not alarming or entirely satisfactory. However, it must be pointed out that the 1-inch jumper from the jacket to the bottom of the cylinder head had not been installed before this inspection and that the rings in this engine were still 3/8-inch instead of the new ¼-inch standard. Operation had been entirely satisfactory at all loads; there was a smooth polish on the cylinder wall and the oil consumption was 10,000 rated horsepower hours per gallon.

Engine No. 6 with all modifications and the 230 Brinell hardness liners was inspected January 18, 1955 after 3,000 hours of operation. The results follow:

Cyl. No.	1	2	3	4
Wear	.002"	.002"	.003"	.002"
Cyl. No.	5	6	7	8
Wear	.002"	.002"	.001"	.003"

The wear rate of .0006-inch per 1000 hours was considered good, operating performance was quiet, oil consumption was above 13,000 rated horsepower hours per gallon of oil and the fuel consumption for all five vapor-phase engines was averaging 8.2 cubic feet per brake horsepower hour.

At this date and in the final stage of this operation experiment was considered successful. Plans are presently afoot to convert one of the original type SVG engine at this station to vapor-phase operation utilizing a low pressure turbine now available for driving fans on the cooling unit, or using the turbine on one of the KVG units and converting it to low pressure steam operation.

—The End

Stop Stuffing Box Leakage NOW!

Your pumps can be sealed positively by Sealol-Flexibox mechanical shaft seals engineered specifically for your pipeline pressures. By eliminating gland leakage, Flexibox prevents waste of valuable product and avoids the constant fire hazard of escaping volatiles.

Sealol-Flexibox engineering experience gained in successfully sealing pipeline pumps for major petroleum companies throughout the world is ready to go to work on your specific applications. Let us submit recommendations for mechanically sealing your pumps, including a detailed analysis of piping connections and control valves essential to proper seal installation. Send for Bulletin 10 describing Flexibox Seals.

SEALOL CORPORATION, 175 POST ROAD, PROVIDENCE 5, R. I.

Baton Rouge • Charleston (W. Va.) • Chicago • Cleveland • Corpus Christi • Dallas
Houston • Los Angeles • New Orleans • New York City • Philadelphia • San Francisco
St. Louis • Tulsa • Edmonton — Toronto (Can.) • Manchester (Eng.) • Paris • Frankfurt

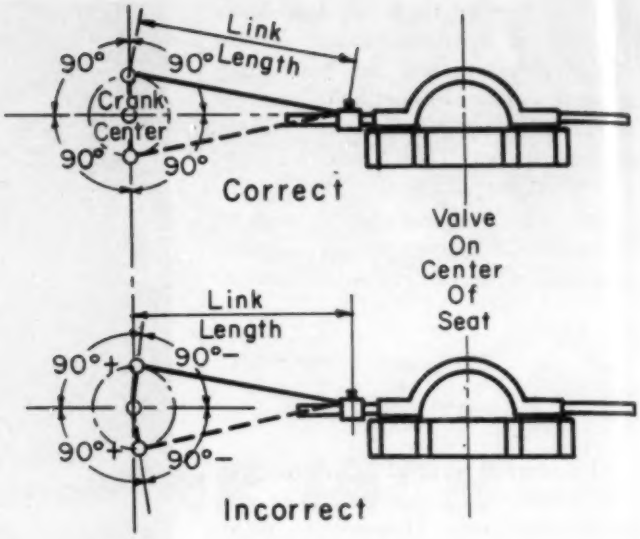
SEALOL

THE BALANCED PRESSURE SEAL

Troubleshooting Displacement Meters

How to locate the cause of meter troubles and prescribe for their repair.

By ED R. GILMORE,
Chief Engineer, Lancaster Motor Parts Company, Tulsa, Okla.



Valve Setting
FIGURE 2

TROUBLES WHICH OCCUR during a meter's diaphragm stroke do not necessarily affect the final volume displaced by the diaphragm. The positions of the entire diaphragm at both the starting end and the stopping end of the stroke determine the volume displaced by the stroke of the diaphragm: provided, of course, that there are no leaks.

These positions for a specific meter and diaphragm design depend primarily on the diaphragm design and the material, the diaphragm linkage mechanism and the differential across the diaphragm at the end stroke positions.

The use of the best part of the diaphragm stroke is obtained by the positioning of the long flag-arm in respect to the flag. Unless this relationship is correct all other efforts toward getting the most efficiency from the meter are greatly handicapped.

Generally, diaphragms and linkages in most meters give the greatest displacement close to the maximum, unrestricted "IN" stroke. The method of accomplishing this result differs slightly on various makes and sizes of meters.

With four chambered meters it is usually best to allow only a small amount of clearance on the diaphragm "IN" stroke when checking with the tangent post and tangent link. Be sure that the "IN" stroke of the diaphragm is used and not the instroke of the tangent link.

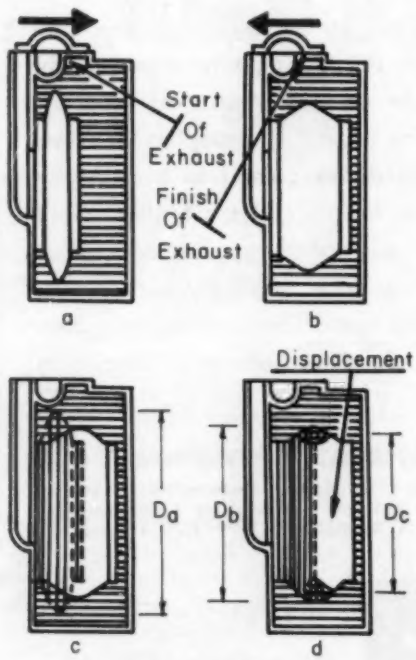
With three chambered meters it is possible to assemble the diaphragm linkage to position the diaphragm pan at the center of the diaphragm at the ends of its stroke before assembly of the diaphragms.

Improved division of the diaphragm stroke is one of the most prevalent troubles found in meters. Be accurate in this division, position the long flag-arms carefully. Make up jigs to hold the arms level while soldering but do not depend on the jigs for the division. Check for division after rigid assembly.

The exact position of the entire diaphragm at the end of its strokes is determined by the valve. The valve must be at the same control position on its seat, but going in the opposite direction when the diaphragm reaches one end position and then the other. The start and finish of the diaphragm stroke occurs at 180 degrees intervals. The valve must therefore arrive at the control point on the seat at 180 degree intervals.

To make this valve setting, place the valve exactly on the center of its seat and make the length of the valve link such that the valve crank is at right angles to the line of travel of the valve.

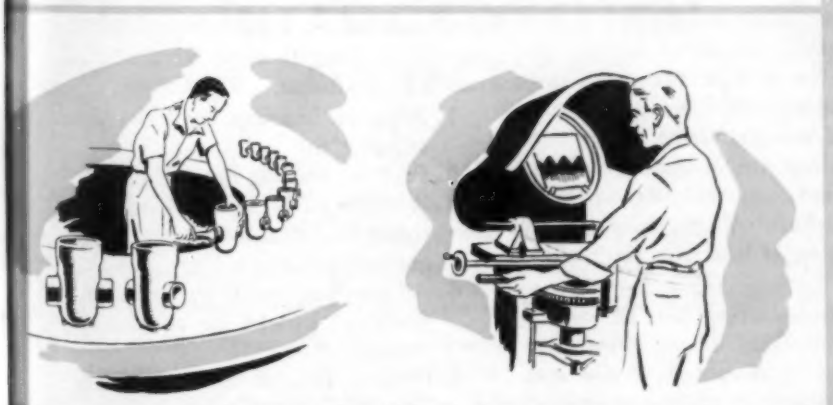
The angle between the tangent, which controls the diaphragm stroke and the valve crank, controls the valve stroke and determines the timing of the valve and the diaphragm.

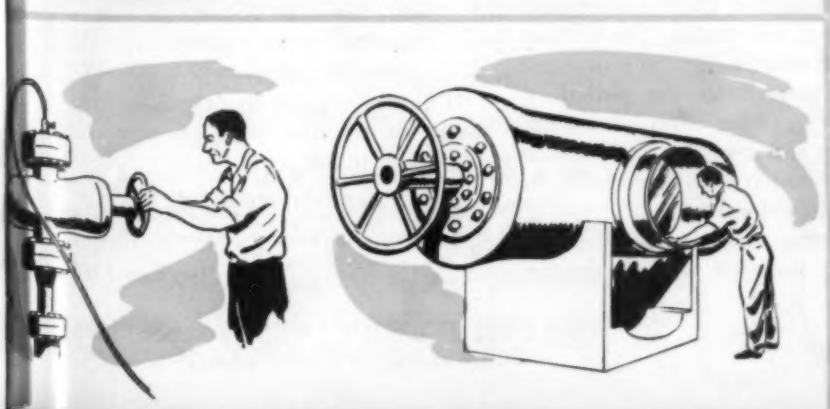


Action Of Diaphragm
FIGURE 1

About the Author

ED R. GILMORE graduated in 1920 from Rensselaer Polytechnic Institute with a mechanical engineering degree and his first job was with Cities Service Company at Bartlesville, Okla. Since then he has had wide experience in the natural gas field and during the past 20 years has instructed at every Gas Measurement Short Course held at the University of Oklahoma and the University of West Virginia. He is now chief engineer for the Lancaster Meter Parts Company, Tulsa.





W-K-M Valves

JUST LIKE INSURANCE

W-K-M's precise control of each step of the manufacturing process insures the excellence of every W-K-M Valve. Depending upon the size and the type of the valve, there will be over 300 separate inspections made on every single valve produced in the W-K-M plant. This is your assurance that W-K-M Valves will not only meet your most rigid specifications, but will provide trouble-free service for years to come.

Receiving Inspection

Raw Castings and materials received in warehouse are inspected for conformity to dimensional specifications.

Chemical & Metallurgical Analysis

Chemical and physical tests are run to determine conformity to ASTM specifications. In the case of some high pressure valves, the castings are inspected by gamma ray technique. Many other castings and materials are checked by magnetic particle methods to assure soundness of structure.

Manufacturing Inspection

All manufactured parts inspected for dimensional accuracy and finish. Also metallurgical and physical testing procedures are applied to maintain rigid control of these parts.

Testing

All valves tested 100% on high pressure test rack to test soundness of body and sealing at both seats.

W-K-M Manufacturing Company, Inc.

A subsidiary of ACF Industries Incorporated

P. O. Box 2117, Houston 1, Texas Los Angeles, California

Export Office: 45 Rockefeller Plaza, New York, N. Y.

The coordination of one diaphragm and valve unit with the other is accomplished by properly mounting the fixed and moving parts about the central axis of rotation.

Every meter has a central axis about which the parts of the mechanism move or are mounted. This axis is usually referred to as the crank in four chambered meters and the main movement in three chambered meters. This axis is usually located by two or more bearings, one or more of which are moveable. In positioning these bearings care must be exercised —not only to get them in line, but also, to have them in the right position in respect to the other fixed parts of the meter such as flag rod bearings, seats, etc.

With the diaphragm and valve units properly coordinated in four chamber meters, one diaphragm reaches an end stroke position when the valve reaches the control seat position every 90 degree position of the tangent crank, as it rotates on the central axis.

Index drive. A worm gear on the central axis drives the index. The index and its drive has nothing to do with the actual measurement of the gas passing through the meter. It merely registers the number of revolutions that the central axis makes. However the condition and alignment of the parts do have a decided effect on the operation of the meter and measurement. The effect is the increase or decrease in the differential across the diaphragm caused by the work required to drive the index.

Effect of various parts on meter performance and proof. Tangent Adjustments: Both the tangent length and its angular relationship to the valve crank are usually adjustable.

The tangent length controls the diaphragm stroke only to the extent that the angular position of the valve crank permits.

The major angle between the tangent and valve crank is determined by the design of the meter. Most meters require that the crank be advanced a few degrees ahead of this major angle, to obtain the correct relationship between the proofs at the capacity and check rates.

The advance of the crank one degree usually causes 1 percent less displacement on the open rate of flow but decreases the check rate displacement only about a quarter as much.

Each make and size of meter has a predetermined tangent length and crank angle of advance, required for the average meter. A few of the items affecting the amount of variance from this length and angle are: flexibility of diaphragm material, amount of surplus diaphragm material, diaphragm and flag stroke deviations, valve and valve stroke deviations, clearances at bearing points and friction.

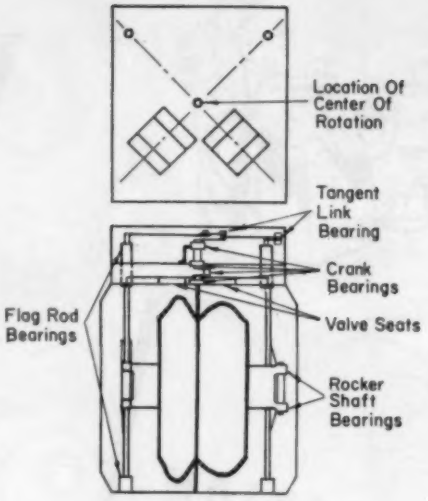


FIGURE 3

Tangent posts tipped either accidentally or on purpose are detrimental to sustaining the desired displacement of the meter in service.

Bent cranks are confusing when trying to coordinate the valves and diaphragms. Such cranks should be straightened or replaced.

Slightly eccentric worms may not be noticed in repair or in minor draft gauge fluctuations. They may result in excessive wear in service.

Index shaft alignment is very important, even though the drive dogs are designed to allow for a moderate amount of mis-alignment. Make sure that the dogs are in good condition and mounted correctly and securely on the drive shaft. Align the shafts by sighting from at least two right angle positions.

The index stuffing box as well as all other stuffing boxes should be packed just tight enough to not leak and free enough to allow unrestricted movement of the shafts. The friction on the shaft must be kept at a uniform minimum throughout the period of service of the meter. The lubricated, spring type stuffing box packing has proved very successful, especially on index shaft stuffing boxes.

A bent flag rod not only causes binds, but also lets the diaphragm make a wild swing, instead of the desired measured stroke.

The only way to tell the condition of a diaphragm is by actually feeling of it. The leather may look dry on the outside but still have sufficient oil in it. Squeeze a fold of the leather lightly—if oil comes to the surface, there is plenty of oil in the diaphragm.

Do not use too much oil in a diaphragm just because doing so will bring the meter back in proof or decrease the differential.

The leather can only hold its own weight of oil. The surplus oil will run out at flowing temperatures of any of its constituants the same as it did previously in service. Excess oiling has proved to be a major cause in the speed-up of meters in service. More oil than the diaphragm can hold at any point on the diaphragm or in the meter case usually proves detrimental rather than beneficial to meter performance and accuracy.

There should be enough oil in the leather to seal the leather at differentials which may be experienced in the normal operation of the meter. In testing diaphragms for leaks a differential of two inches of water pressure is adequate. If greater pressures are necessary to test for the possibility of the diaphragm coming loose from the pan, the leaks which occur at the higher pressure can be disregarded.

Excessive wear at bearing points is detrimental in maintaining a consistent proof in service.

Friction, and change in friction in service is one of the most serious problems that exists in displacement meter measurement. Everything possible should be done to keep friction at a uniform minimum.

1. Align all bearings for a dry free running fit.
2. Pack all stuffing boxes lightly.
3. Remove all burrs and loose particles from the edges of the ground surfaces.
4. All rotating, oscillating or sliding surfaces should be thoroughly cleaned.
5. Only a limited amount of the best lubricant obtainable should be used at any point where it cannot be adequately confined.

It is the change in friction in a meter in service that causes the change in proof.

ACKNOWLEDGMENT

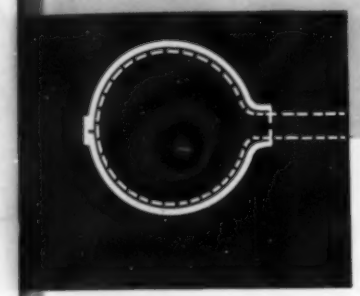
Presented at 30th annual Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

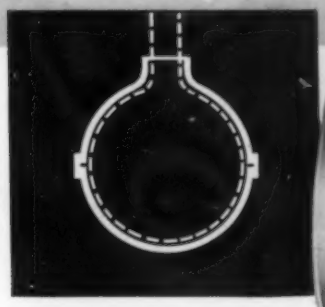
—The End

AVAILABLE IN 2 ADVANCED DESIGNS

LADISH

HOT TAP REINFORCING TEES





IMPROVE AND SIMPLIFY REINFORCEMENT OF HORIZONTAL OR VERTICAL BRANCH CONNECTIONS

L
TO MARK PROGRESS

For several years prominent pipe line companies have used this Ladish development as a practicable means to make safe hot-tap branch connections . . . and to reinforce the entire area of the connection with greater strength than otherwise possible.

Choice of design simplifies assembly . . . joints easily accessible for welding . . . welding heat safely away from direct contact with main line . . . minimum excavation required.

Reinforcing tees are available in sizes and wall thicknesses to meet your requirements.

Other Ladish Developments for the Pipe Line Industry Include—*MULTIPLE OUTLET HEADERS, EXTRA LONG RADIUS (3-R) ELBOWS, ANCHOR FLANGES*

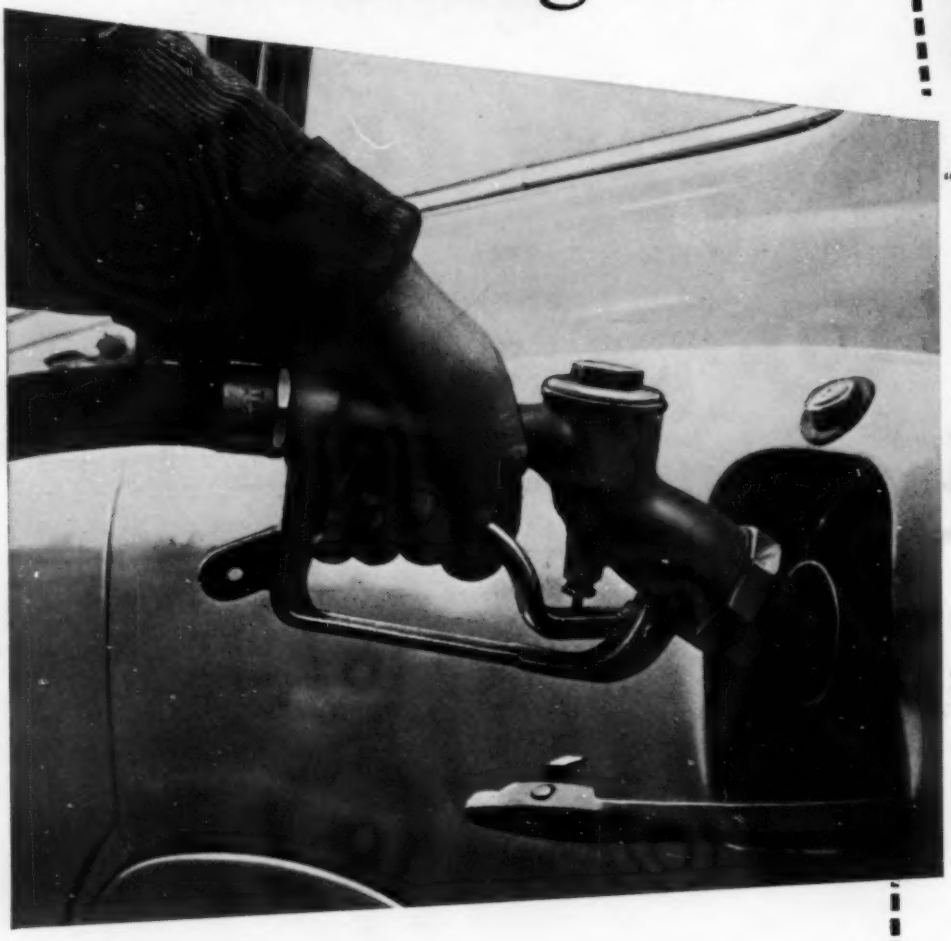
THE COMPLETE *Controlled Quality* FITTINGS LINE

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland
Chicago • St. Paul • St. Louis • Atlanta • Houston • Odessa • Tulsa
Los Angeles • San Francisco • Seattle • Havana • Mexico City • Brantford, Ont.

From drilling to filling . . .



50 watt V.H.F. Fixed Station

"Reporter" Mobile Radio Telephone

Walkiephone

60 watt Fixed Station

. . . is a long story. We come in at the beginning, for even before the oil is found survey parties are using Pye Radio Telephones. From then on, through every stage to the consumer—extracting, refining, transport by sea and distribution, Pye Radio Telephone Schemes keep oil-men on the move.
Pye Systems Planning Department have a wide experience of oil communication problems. Why not let them advise you?

Telecommunications
CAMBRIDGE ENGLAND

Agents throughout the world. Please reply in the first instance to:—

PYE LTD., TELECOMMUNICATIONS DIV., NEWMARKET RD., CAMBRIDGE, ENGLAND

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to Donald M. Taylor, Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.

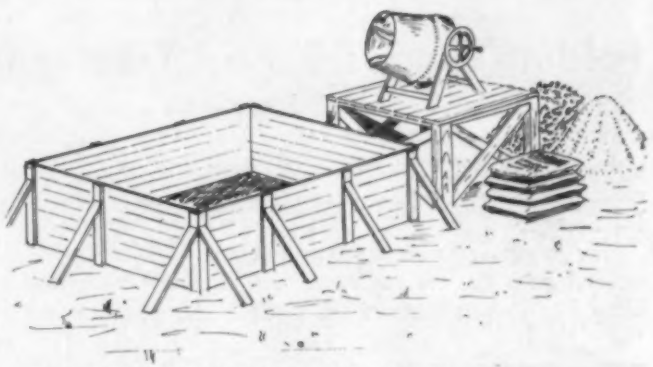
Pipe Line Construction

—14—How to estimate the quantities of sand, gravel and cement required for one cubic yard of concrete.

First, to determine the number of bags of portland cement required, divide 44 by the sum of the parts of cement, parts of sand and parts of gravel. Then, to calculate the number of cubic yards of sand needed, multiply the number of bags of cement by parts of sand times 0.035. To figure the cubic yards of gravel needed, multiply bags of cement by parts of gravel times 0.035.

Example: Find the quantities of cement, sand and gravel required for one cubic yard of 1 : 2 : 4 concrete.

$$C = \frac{44}{1 + 2 + 4} = 6.28 \text{ bags of cement}$$



$S = 6.28 \times 2 \times 0.035 = 0.44$ cubic yards of sand
$G = 6.28 \times 4 \times 0.035 = 0.88$ cubic yards of gravel

Miscellaneous

—24—How to determine the friction loss for water or light liquid in a length of hose.

Multiply the diameter of the hose in inches by the square of the working pressure in pounds per square inch divided by the length of hose in feet. Add to this value the figure obtained by dividing the working pressure by the length.

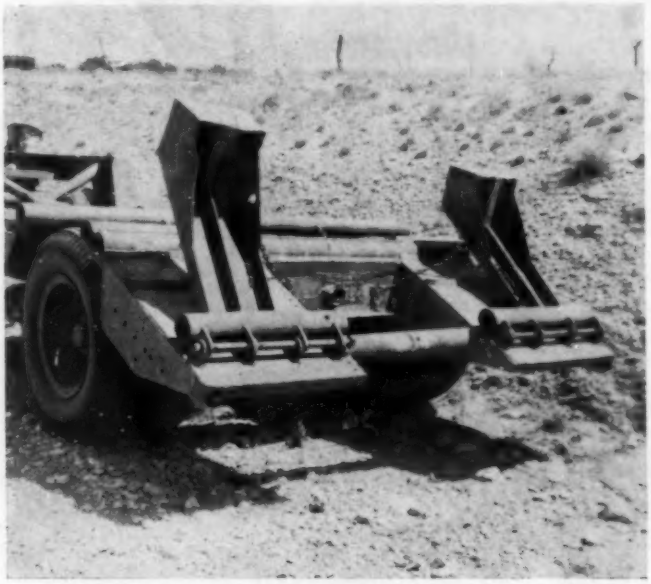
Example: Find the friction loss in 100 feet of 2-inch hose carrying a working pressure of 400 pounds per square inch:

$$\text{Friction loss} = 2 \times \left(\frac{400}{100}\right)^2 + \frac{400}{100}$$
$$= 2 \times 16 + 4$$
$$= 36 \text{ pounds per square inch}$$

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Folding Ramps Speed Tractor Loading

A shop-made ramp attached to the back of a trailer makes it easy to load and unload track-type equipment quickly. Salvaged quarter-inch plate and other scrap material usually found around the yard are used in fabrication.

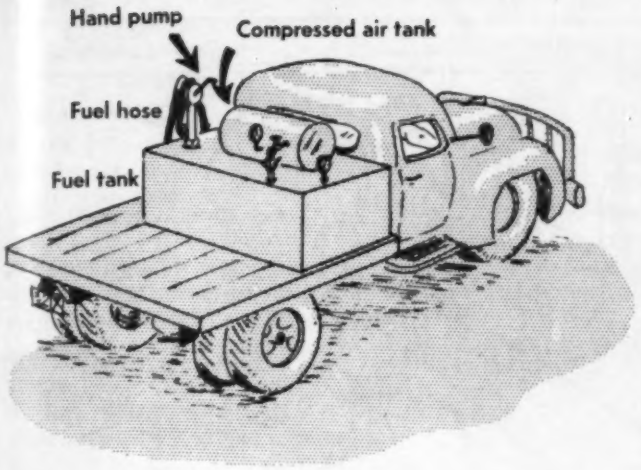
The ramp is made in two sections. The top one is welded onto the trailer frame, and the lower section is hinged to it by means of three-quarter inch rod passing through pads as shown. Lengths of 3-inch pipe form the upper part of the ramp and protect trailer tires. Cleats are welded onto the face of both sections.

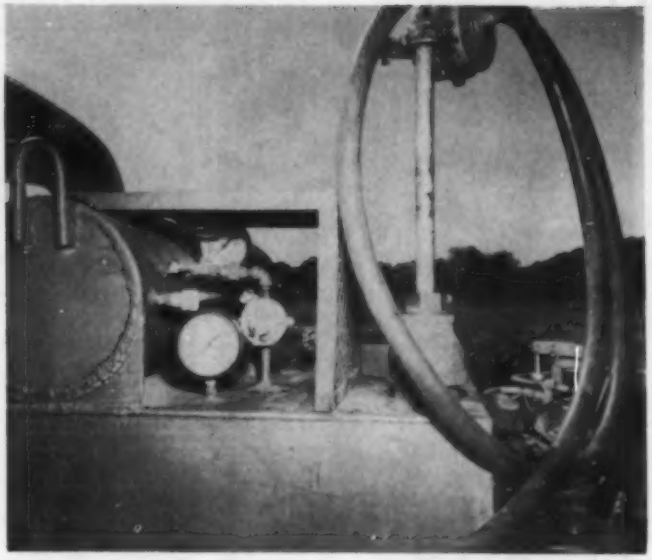
Each movable section is made by building up plate material so that it is strong, yet light enough for one man to fold up after the tractor is loaded. Tail lights are installed on each rear corner.

Mount Compressor on Rubber Belting to Reduce Vibration

Compressor vibration can be eliminated by setting the base on pieces of rubber cut from belting material. To get the full effect of the cushioning material, eliminate hold-down bolts; instead, use turnbuckles to hold the base stationary and take up belt slack. Plates welded to the bottom of the skids keep the unit from moving sideways.

Two I-beams first are grouted into the concrete floor. Skids are fitted with strips of metal so that the base cannot move sideways, yet is free to slide back and forth on the rubber cushions. Turnbuckles are then fitted into the sides of the skids and the ends of the beams as shown. When tightened, the turnbuckles will give proper tension to the V-belts and prevent the base from creeping.





Pressurized Fuel Tank Cuts Equipment Refueling Time

Use compressed air to force fuel from fueling trucks and reduce fueling time on the pipe line.

The compressed air tank is mounted above the fuel tank and has a pressure line going to the top of the tank through a valve and regulator as shown. A gage is placed on the air tank so that it may be pressured up at a service station or shop when low. The fuel tank also is fitted with a gage, a relief valve and a bleeder cock.

To fuel a tractor or other equipment, the fuel hose is placed in the tractor tank and the compressed air is admitted to the fuel supply tank. When the tractor tank is full, the air is turned off and the valve on the fuel tank opened to allow the pressure to bleed off immediately. Pressure is maintained on the fuel tank only during transfer of fuel. If for any reason air pressure is lost, a standby hand pump can be used.

Bull's Eye Saves Field Signs from Hunters

Each year during hunting season, field signs are likely to take a beating from eager hunters zeroing-in their sights. An Ohio oil field superintendent mounted a bull's eye on the company's Walker Dome, Wyo., signs to oblige the hunters. The area around the field is rich with game such as elk, deer, bobcats, antelope and an occasional mountain lion.

As the picture shows, hunters will use the bull's eye, a much better target than the sign. Both the field operators and the hunters are happier. From the accuracy of the shooting, apparently the target improves the hunter's aim, too.

EVERYTHING

for your corrosion protection problems

AN-SPEC Magnesium Anodes
Prepared Backfill
Anodes for Emulsion Treaters & Heat Exchangers
Field-Proven Rectifiers
Holloway Shunts
Agra Test Instruments
National Ground Anodes
National Carbon BF3 Backfill
Coke Breeze 98% Graded ⅜ Down
Complete Cadweld Equipment
Copper Sulphate Electrodes
Insulating Materials
Anaconda CP Cable
Johns-Manville Trantex Tape

Complete Engineering Service

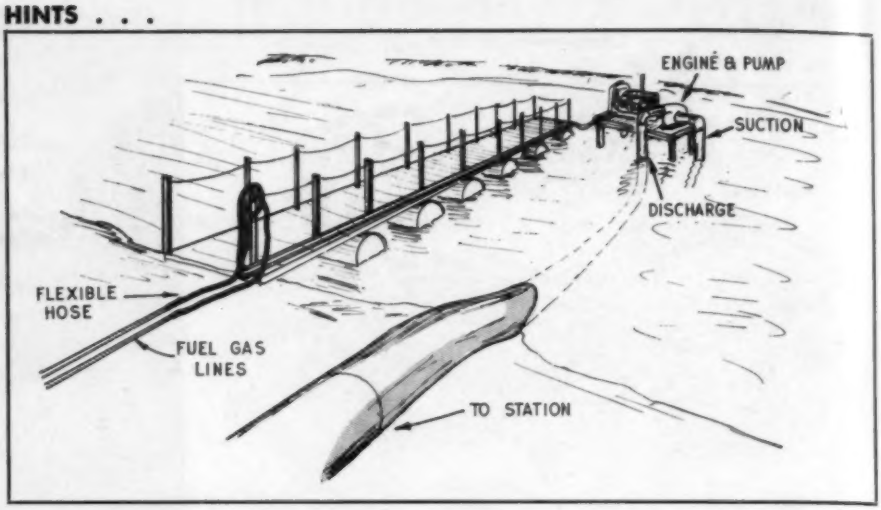
- SURVEYING
- ENGINEERING
- INSTALLATION
- MAINTENANCE

MANUFACTURERS OF —

ANODE SPECIALISTS
AN-SPEC
HIGH QUALITY ANODES

PIPE LINE ANODE CORPORATION
P. O. BOX 996 PHONE CHerry 2-6214
TULSA, OKLAHOMA

HINTS . . .

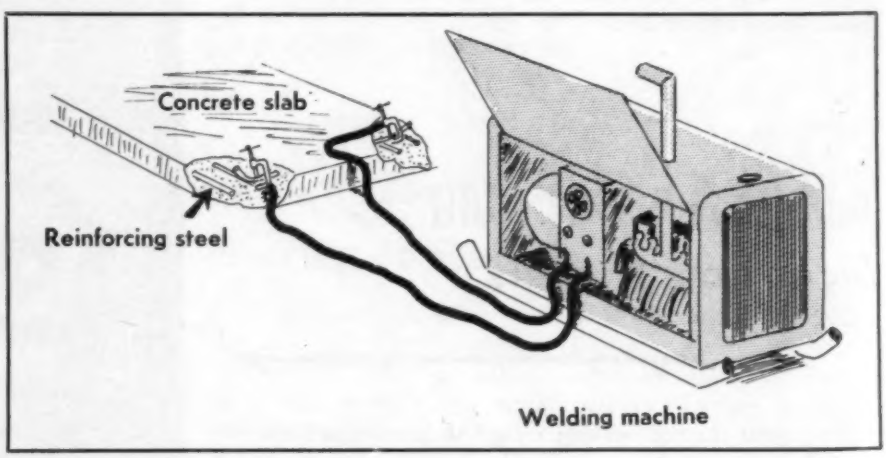


Use Flexible Couplings on Pontoon Bridges

Many times it becomes necessary for pipe lines to reach sources of supply in marshy country. The pontoon bridge or catwalk, an idea borrowed from the Army Engineers, has proved the answer to many problems.

In the particular situation shown, it was desired to pump water from the center of a marshy lagoon to higher ground for cooling water purposes. The contractor installed a gas driven engine and suction pump assembly over the lagoon. A pontoon bridge was fabricated for access to the engine.

The fuel for the engine, raw gas, was piped to the engine in two lines to make a dependable supply in case one of the lines became fouled. To connect these pontoon lines to the source of supply at the shore, two high pressure hoses were used as a coupling between the two steel fuel pipes. In event of a rise or lowering of the water level, the lines would not be broken by strain. Several feet of slack allowed for a safety margin, and the portable pump in the center of the marsh, could go unattended for long periods of time.

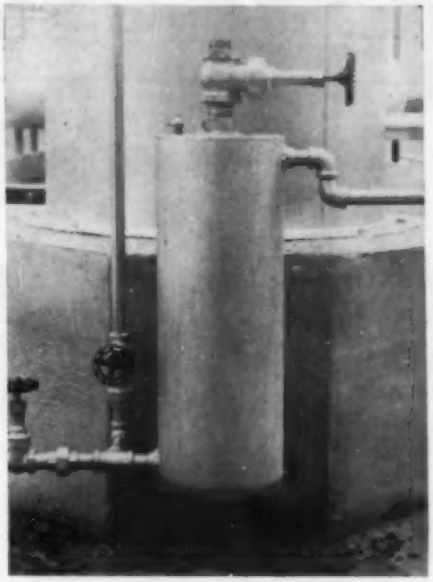


Welding Machine Used to Break Up Slab

To save many hours of labor in breaking up concrete slab during station modification, make use of a welding machine. First chip away enough of the slab to expose the opposite ends of reinforcing steel. Connect the electrodes of the electric arc welder to each end and start the machine. The current through the rod will raise the temperature of the steel enough to expand it and cause the concrete to split. By repeating this procedure on through the slab it can be quickly broken up.

Make Mixing Vessel from Pipe, Fittings

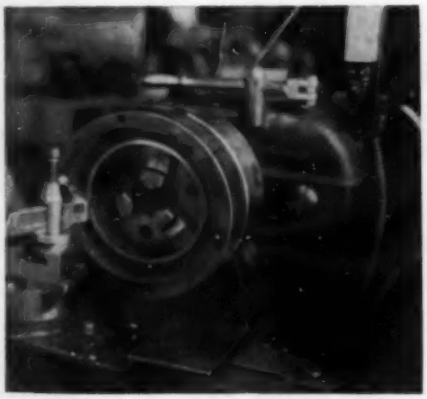
Whenever a small volume of chemicals is to be added to any liquid in a closed system the problem of even distribution arises. This problem can be solved by fabricating the additive vessel shown.



Here, a four-foot section of 14-inch pipe was made up into a tank by welding steel plate on each end. To the bottom was welded a coupling to match the size of pipe carrying the parent liquid. On the opposite side at the top, another coupling of the same size was welded for the stream outlet. A 2-inch coupling was welded to the top and a nipple and valve installed. A ¼-inch petcock installed in the top allows for release of pressure once the bypass valves are opened.

Chemicals are poured into the top of the vessel; the parent fluid picks up the additive into the stream while passing through the vessel. The pipe shown on the left serves as a bypass when no chemicals are to be added. When all of the chemical is picked up into the stream, the unit is bypassed until time for the next addition.

Refacing Case Saves Replacement

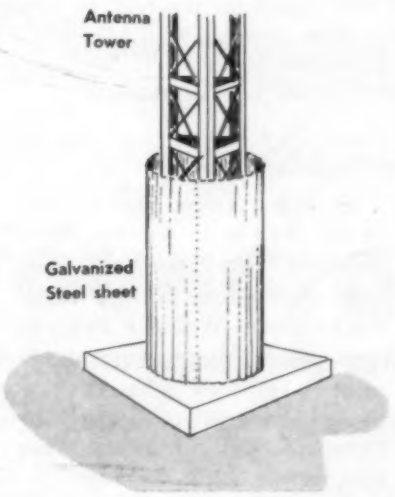


This simple means of saving the cases which fit around the compressor piston rod packing glands was devised by a pipe line company foreman.

During the ordinary wearing period, while the inside diameter of the glands are wearing down, the cases which fit around the glands wear on the thrust sides. Previously the entire assembly was replaced. Now, the sides of the cases are turned down so that the space into which the new gland fits is the same dimension as the new case.

Galvanized Steel Guard Keeps Children Off Towers

Unguarded pipe line radio towers could be the cause of injury to children and damages to the company. To prevent the possibility of such accidents, a foreman fabricated the sheet guard shown.



Three sheets of galvanized drain roofing about ten feet long were fastened together to form a cylindrical guard around the tower. Cost of protection is less than $5 per tower.

Protective Clothing by Sawyer

Wears like iron — takes endless rubbing, scraping, snagging, and still gives full protection.

100% Waterproof — made with top quality base fabric saturation-coated first and then coated with 6 coats of Neoprene Latex.

Positively will not blister, crack or peel. Its longer lasting quality means greater economy.

Also: Three-quarter and long coats, aprons, coveralls and many other styles. All clothing made in black or yellow.

FROG BRAND

THE H. M. SAWYER & SON CO.

Cambridge, Massachusetts

For more data on advertised products, use Readers' Service Cards, last page.

MERCOID
PRESSURE & TEMPERATURE
CONTROLS

ENGINEERED FOR SEVERE OPERATING CONDITIONS

Series "D"

Only Mercoid Offers

● ***HERMETICALLY SEALED CONTACT***

Always dependable—whether it operates once per year or several times per minute. It remains operative at all times because dust, dirt, grease or moisture cannot contaminate the contacting elements. There can be no sticking or welding of the contact points.

● ***OUTSIDE ADJUSTMENTS***

Independent outside adjustments are provided for setting both the cut-in and cut-out points. Differential may be widened as desired. No tools are required.

● ***VISIBLE CALIBRATED DIAL***

No guesswork or calculations are required—the pointers indicate on an accurately calibrated dial, the exact operating pressures or temperature.

● ***VISIBLE OPERATION***

You can tell at a glance whether switch circuit is on or off.

● ***BOURDON TUBE OPERATED***

UNDERWRITERS' APPROVED

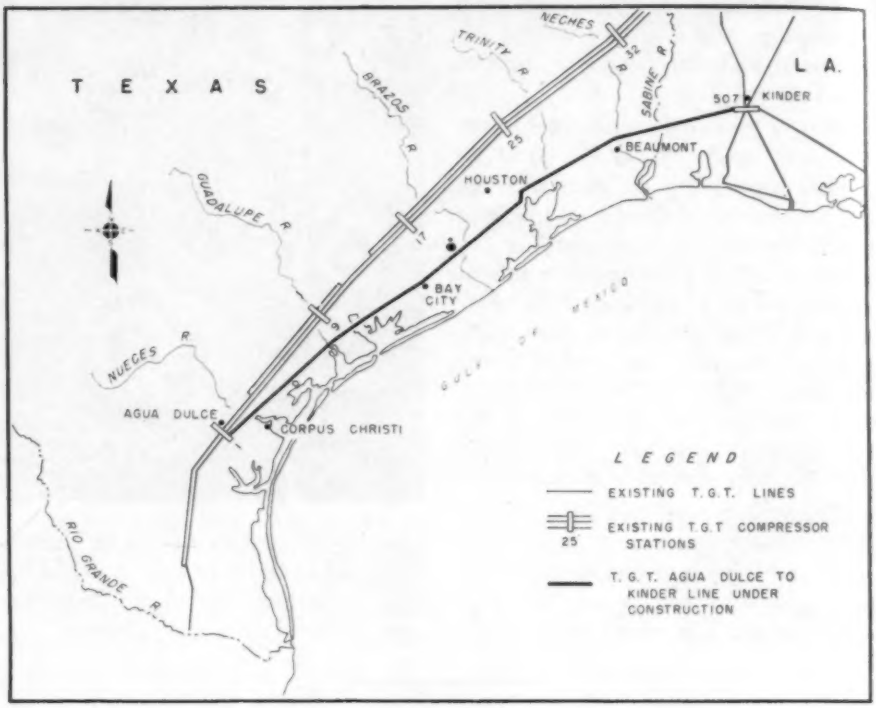
All operating ranges for Series DA-21, DA-35 and DA-55.

Available for general use, outdoor use or hazardous locations.

WRITE FOR BULLETIN 4B

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION



Tennessee Gas Begins Work On Agua Dulce-Kinder Line

By MELVIN A. JUDAH, Pipe Line Industry Staff

Construction is due to begin early this month on Tennessee Gas Transmission Company's 30-inch, 370-mile pipe line from Agua Dulce, Texas, to Kinder, La. The new line will parallel the coastline near the Gulf of Mexico and pass through an important gas supply area, states W. C. McGee, Jr., TGT senior vice president.

Contracts for work have been let to the following firms:

93 miles, from TGT's Agua Dulce Station to Lavaca Bay—Morrison Constructors, Inc.

73 miles, from Lavaca Bay to Brazos river—Williams Brothers.

96 miles, from the Brazos river to State Highway 105 near Beaumont—Houston Contracting Company and the H. C. Price Company.

61 miles, from State Highway 105 to TGT's Kinder, La. station —Western Constructors.

Along the way, eight major submerged water crossings will be made. Contracts have been awarded for these also:

Guadalupe river, N. A. Saigh Company; Colorado river, Williams Brothers; Brazos river, Houston Contracting Company and H. C. Price Company; the Houston Ship Channel and Cedar Bayou, the Panama-Williams Company; and the Trinity, Neches and Sabine rivers to Associated Pipe Line Constructors, Inc. Contract for the Lavaca Bay crossing has not been let.

Work on the $35 million line is expected to be completed by November 30.

IT'S NEW!

MYOCO PIPE REFORMING CLAMP

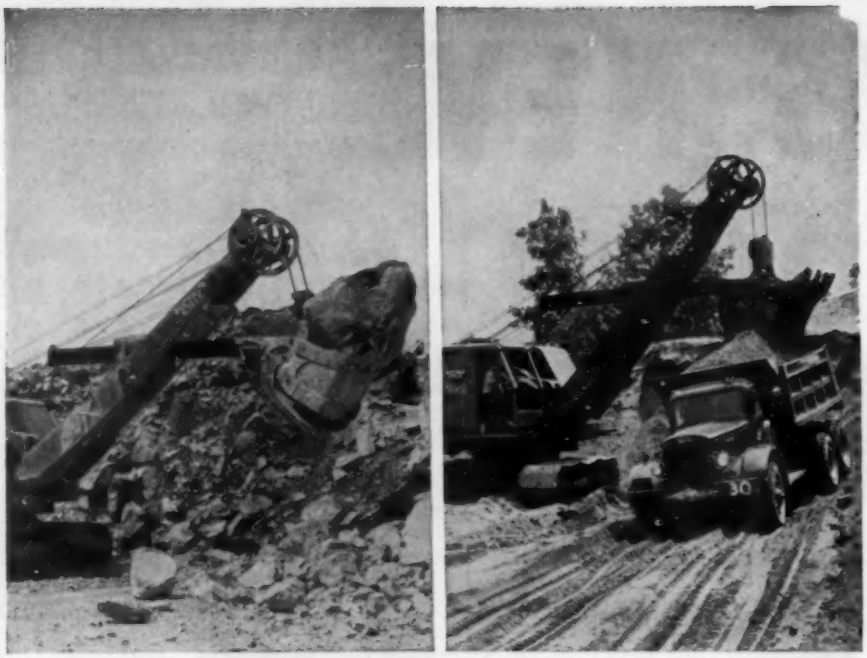
1. Will positively align pipe for welding, without wedging or hammering of pipe.
2. Different outside diameters up to 1¼ inches can be swedged to fit, without wedging or hammering.
3. Pipe can be aligned to flanges and valves without wedging or hammering.
4. Chrome-Moly construction affords less weight with greater strength.
5. Clamps available in all sizes up to 72" O.D. Pipe.
6. Now in use on major pipeline, station and refinery construction jobs.
7. Prices and Performance Records on request.

Patent No. 2632417 & Pat. Pend.

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

1200 Old Spanish Trail — Telephone MAdison 3-4425 — Houston, Texas



Same equipment—different jobs

Should you change wire rope constructions?

Under normal conditions there is one best size and type of rope for every wire rope using machine. This is the one you use day in and day out on routine work. But what about other conditions, the tough job, the unusual job? Suppose abrasion becomes a bigger factor, or unusual strength is needed, or more flexibility? Is a change of rope type in order?

Take a power shovel, for example. Moving dirt, sand, gravel, ore, it works fast handling smooth loads. If it is on a long job of clearing large rock, however, it will move slower and receive heavy jars and shocks. A different Red-Strand wire rope construction will probably absorb the shocks better and last much longer.

Take *your* equipment for another example. Whatever your business and however you use wire rope—if unusual conditions arise call in your Leschen technical man. Leschen makes all types, knows the special advantages and qualities of every one, and can help you choose the rope that will do your job best—on shovels or any type of equipment. Leschen wire rope is working profitably in every industry.

Your Leschen man can easily be reached through your nearby Leschen distributor. See him soon.

Depend on Leschen's higher-than-rated quality for longer-than-expected service.

LESCHEN
HERCULES *Red-Strand*® WIRE ROPE
LESCHEN WIRE ROPE DIVISION
H. K. PORTER COMPANY, INC.
St. Louis 12, Missouri
HKP

H. C. Price Earns Top Award Of National Safety Council

The National Safety Council recently presented H. C. Price Company the Certificate of Commendation, recognizing a record set by one of Price's pipe line construction units. Superintendent R. L. Ezell's spread worked a total of 434,528 man-hours without a disabling injury for the period November 20, 1953, to December 31, 1954.

Only 37 such high awards have been given. This is the first one ever won in the field of pipe line construction.

Transco Gets Approval to Serve Sun Oil Refinery

In a recent FPC examiner decision, Transcontinental Gas Pipe Line Corporation received temporary authority to add 27 miles of loop line in Louisiana, Georgia, North Carolina, Virginia, and Maryland. These facilities will enable Transco to deliver an additional 10 million cubic feet of gas per day to Sun Oil Company's refinery at Marcus Hook, Penn.

Cost of the additional facilities is $3,426,000.

Great Lakes Lets Contract For Iowa Products Loop

Great Lakes Pipe Line Company has awarded the contract for construction of a 12-inch loop of its product line between Des Moines and Iowa City, Iowa, to the M-R Company of Wichita, Kansas.

The new 106-mile line will parallel Great Lakes' 6 and 8-inch lines. Work is divided between two spreads. Construction is now underway.

Construction Begins on Southern Counties Loop

Work is scheduled to begin early this month on a 31.5-mile loop of 30-inch on the Southern Counties Gas Company of California line between Cactus City and Desert Center, Calif. The project will complete paralleling of the company's 210-mile line.

Approval recently was given to the project by the California Public Utilities Commission. Cost of additional facilities is estimated at $2.5 million.

Engineers Limited of San Francisco has been awarded the job. Completion of the line is scheduled for mid-November.

The most compact, reliable sampler ever built . . .

THE NEW Gilbarco

Small in size...
light in weight

AUTOMATIC SAMPLER

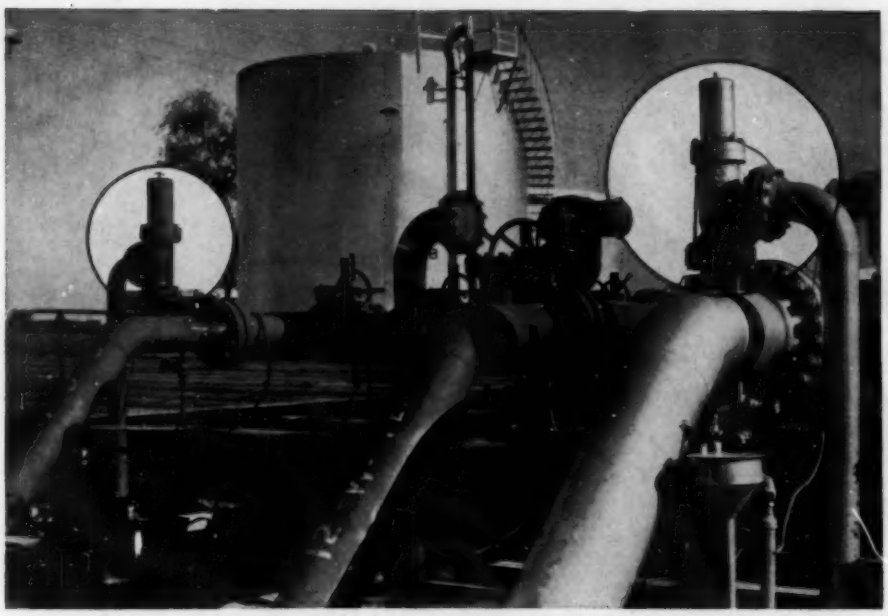
Here's a new compact, completely automatic, magnetically powered and electronically controlled sampler designed to provide a continuous sample from process or pipe lines.

USERS GET ALL THESE IMPORTANT ADVANTAGES.

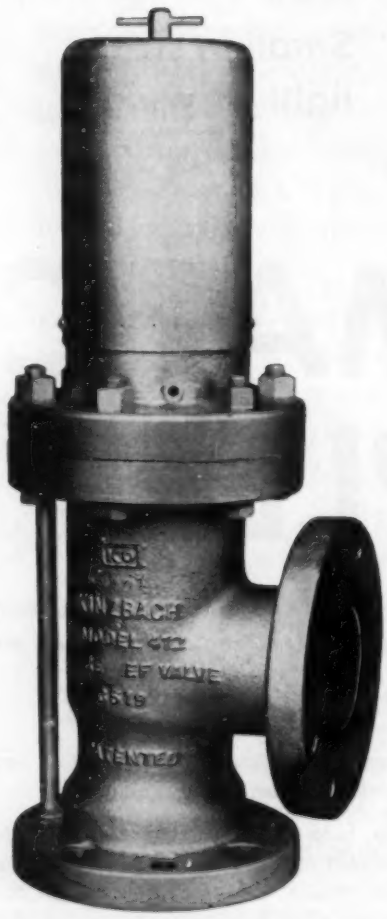
- ★ Proportional to time or flow
- ★ Settings for 20 to 300 cycles per minute for more accurate sampling
- ★ No packing glands, no leakage
- ★ No electric motor, no mechanical switches
- ★ Simple to install and service
- ★ LOW initial cost . . . LOW maintenance cost
- ★ Completely explosion-proof . . . no pressure relief valves required
- ★ No hold-up time from pipe line to sample receiver; because a portion of the stream is by-passed through the sampler

Before you buy any other sampling unit, write for full details on this New Automatic Sampler.

GILBERT & BARKER MFG. CO. • WEST SPRINGFIELD, MASS. • TORONTO, CANADA



Positive Protection Against Pressure Surges



KINZBACH
MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.

Backhoe is loaded into hold of German freighter M. S. Belmonte as $2.5 million worth of pipe line construction equipment is assembled on the Houston dock for NATO Turkish products line. Spread was shipped to Iskenderun, Turkey.

Equipment Sails for Turkish-NATO Line

A complete pipe line spread recently sailed from Houston for the Turkish port of Iskenderun. With this "fleet," Associated Pipe Line Contractor's, Inc. will build the 450-mile NATO products line from Iskenderun, Turkey, northeast to Batman. The line is scheduled for completion in 14 months.

In addition to the machinery and material needed for constructing the line, the shipment included portable, air conditioned housing for about 200 men. Lee Construction Corporation built the housing units and handled export arrangements for Associated. Eleven completely furnished skid mounted units provide kitchen, bathroom, recreation room, laundry, office and sleeping quarters for the pipe line crew. About 150 Turks will be hired; Associated plans to take about 40 men to Turkey for the Job.

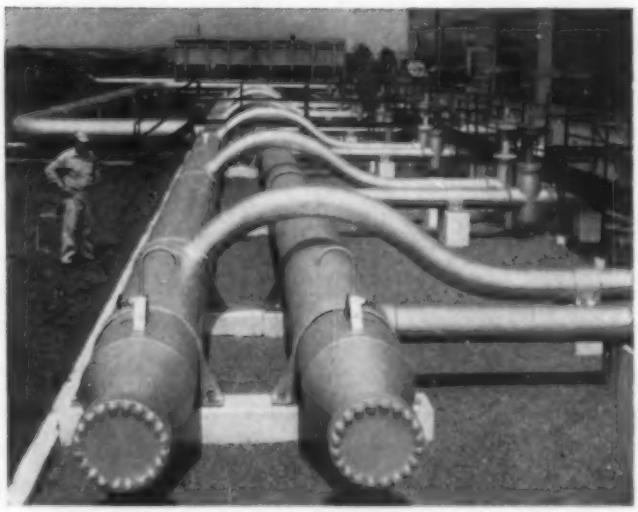
Over $2.5 million worth of equipment and material was loaded aboard the German freighter, M. S. Belmonte. The shipment consisted of 65 units of automotive equipment, 21 tractors, 2 ditching machines, 9 backhoes, 5 air compressors, 6 dope kettles, 4 skid mounted tanks, 180,000 pounds of welding rod, over 4 million pounds of pipe line enamel, a light airplane, 140,000 pounds of pipe wrap, and 600,000 pounds of pipe, steel and tools.

Normal Line Service.. Compressor Stations.. There's Bethlehem Gas Pipe for the Job

COLD-EXPANDED LINE PIPE. With the recent installation of facilities for hydraulic expansion at our Steelton, Pa., plant, we are now able to offer the oil and gas industries cold-expanded, electric-fusion-welded line pipe from 18 in. to 36 in. OD. Available in wall thicknesses to ⅝ in. and in 40-ft lengths. We are equipped to grit-blast, prime, coal-tar-enamel and wrap the pipe to your specifications.

HIGH-STRENGTH PIPE. For use at compressor stations and wherever high pressures, pulsation and vibration are encountered, we recommend pipe fabricated from Mayari R, our high-strength, low-alloy steel (yield point—50,000 psi min; tensile strength—70,000 psi min). This pipe has exceptional endurance strength (about 50,000 psi) as well as good ductility and impact qualities. Welds readily using normal procedures.

More information about Bethlehem Gas Pipe is yours for the asking. We suggest that you contact the Bethlehem sales office nearest you.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Where do you get Service for... HERCULES ENGINES?

Here's a List of Over 550 HERCULES Service Outlets...

● For the past few years, we here at Hercules have been enlarging our sales and service organization. New factory branches have been added, new distributors signed and two branches have moved to larger and more modern quarters.

We have just printed a list of Hercules Distributors and Dealers. There are over 550 Hercules Service Outlets listed. 241 of these outlets are located throughout the United States and the remainder are export outlets which make up our world-wide service organization.

If you operate your Hercules Engines in different regions of the country, you will want a copy of this booklet with each piece of Hercules powered equipment. We will be happy to send you a copy of "The Hercules Distributor and Dealer List" if you will write us on your letterhead.

HERCULES ENGINES

HERCULES MOTORS CORPORATION

40 Years of Engines for Industry

137 Eleventh Street, S. E. ● Canton, Ohio

Natural Gas Storage Gets Nod for Herscher Additions

Under a recent FPC order, Natural Gas Storage Company of Illinois is authorized to construct pipe line facilities to boost maximum daily withdrawals from its Herscher field from 150 million to 430 million cubic feet. To accomplish this, Natural Gas Storage will construct 31 miles of 36-inch line from Herscher to a point on the Texas-Illinois line near Joliet.

Work is scheduled to begin immediately on the $7.5 million project and is to be completed in three months.

In related action, the FPC authorized Texas-Illinois to construct a side tap connecting its system with the 31-mile line. Natural Gas Pipeline Company of America also was authorized to construct five lateral lines to permit delivery of increased volumes of gas to customers in Iowa and Illinois. Washington, Iowa and Mendota, Sycamore, Rockford and Gray's Lake, Ill., will be served by proposed additions.

Natural Gas Storage engineers are continuing investigations to pinpoint the source of gas venting from the Herscher Dome. This is now estimated to be about 6 million cubic feet per day; 2 million cubic feet is being returned to the dome by a pilot gathering system. A permanent gathering system to recover and reinject the venting gas will be built. The Herscher field represents an investment of about $17 million.

Pure Transportation to Buy Into Sinclair Line

Negotiations are being completed for the sale by Sinclair Pipe Line Company of a minor interest in its "Big-Inch" line to Pure Transportation Company.

The 670-mile line, consisting of 22-inch and 24-inch pipe, carries crude oil from Cushing, Okla., to the Chicago area. It was completed in 1953.

Pure Transportation officials said the purchase would add an important company-owned link to the common carrier pipe line systems supplying crude to Pure Oil's refinery at Lemont, Ill., and its two Ohio refineries. Pure is buying an "undivided interest" in the line, acquiring a share in the physical assets of the line rather than a stock interest. Sinclair will continue to operate the line.

TRACTOR-TYPE CRAWLERS OFFER GREATER MOBILITY TO PIPELINERS

Provide Important Advantages for Traveling Over Rugged and Steep Terrain

Performance reports on 15-B and 22-B excavators equipped with special tractor-type crawlers prove the value of this mounting on pipeline jobs. From New Mexico we've received this typical report:

"The country was rocky and, in places, the hills were so steep that tractor winches were needed both as an anchor in digging, and also to let the backhoes down the slopes when digging was completed. I noticed that the tractor-type treads on the 22-B's allowed them to travel and dig unaided in many places where machines, equipped with conventional treads, were helpless without tractors and winches."

And the ditch foreman on this spread says:

"Bucyrus-Erie machines stand up better on tracks, travel better, and the road gear saves time. I like the new tractor-type treads on hills, slick places, and on snow. They have more clearance and don't high center on rocky roads. The sealed bearings are also a very good feature."

That's the story. Equipped with sure-gripping crawlers, 15-B and 22-B dragshovels can climb grades as steep as 35%. Deep grousers provide sure traction. Ground clearance under housing is 16½" for 15-B and 20¾" for 22-B — enough to permit travel over stumps and other low obstructions. Special positive sealing protects all track-roller bearings from water, dust, grit, and dirt.

See your nearby Bucyrus-Erie distributor for details.

117E55

BUCYRUS ERIE

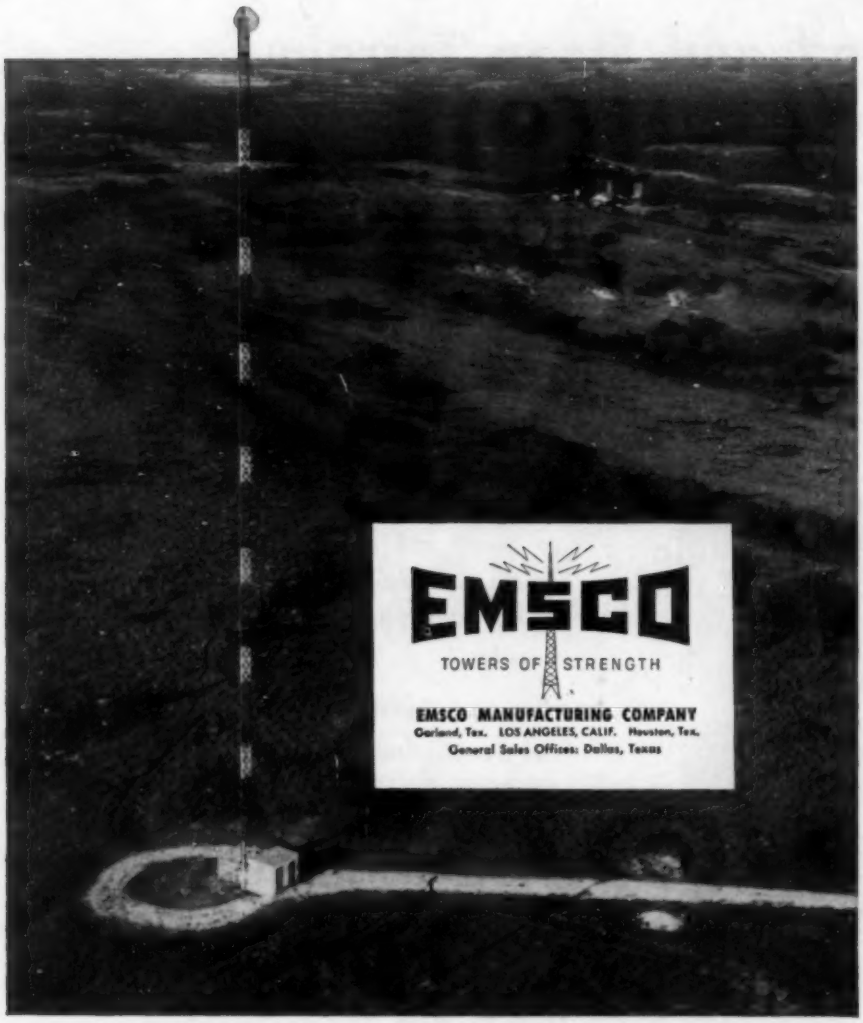
South Milwaukee Wisconsin

1880 75 1955

YEARS OF SERVICE to Men Who Shape the Earth

For more data on advertised products, use Readers' Service Cards, last page.

"steady as a rock" in any weather



Typical Emsco guyed microwave installation in Oklahoma.

Emsco microwave towers are sturdy, steady . . . assure dependable microwave operations. Unique bridle guying of the tower top holds torsional deflection to a minimum.

A pair of guys on each side of Emsco towers are anchored in a reverse direction. If the tower tends to twist because of wind, three of the guys will tighten and hold deflection of the tower top within specifications.

Every Emsco tower design meets RETMA specifications. Hot Dip Galvanizing provides protection against corrosion. Bolted construction permits quick, sure visual inspection.

For guyed or self-supporting towers unequaled for safety, structural rigidity and economy . . . specify Emsco. Prompt delivery is assured.

E-214-55

Trans-Canada to Sell Gas To TGT at Minnesota Border

Tennessee Gas Transmission Company and Trans-Canada Pipe Lines Limited recently signed a contract for sale of 200,000 Mcf per day to TGT at the Canadian border near Emerson, Manitoba. TGT also will have the option to buy an additional 200,000 Mcf when and if it is available at the transfer point.

To move the Canadian gas to U. S. consumers, TGT proposes to lay a 1050-mile pipe line from the border southeast through Minnesota, Wisconsin, Illinois, Indiana, Kentucky and Tennessee. Near Nashville, the line will connect with TGT's main pipe line system carrying gas from Texas and Louisiana to New England. Plans call for gas to be sold along the Minnesota-Tennessee line to distribution companies presently without a source of natural gas.

TGT will file an application with the Federal Power Commission soon requesting permission to import the gas from Canada and to construct the new pipe line.

On a short-term basis, TGT will sell up to 86,755 Mcf of gas per day to Trans-Canada at the Canadian border near Niagara Falls. Gas will be carried through Trans-Canada's existing pipe line to Toronto, and from there through a Toronto-Montreal line to be constructed by Trans-Canada in the near future.

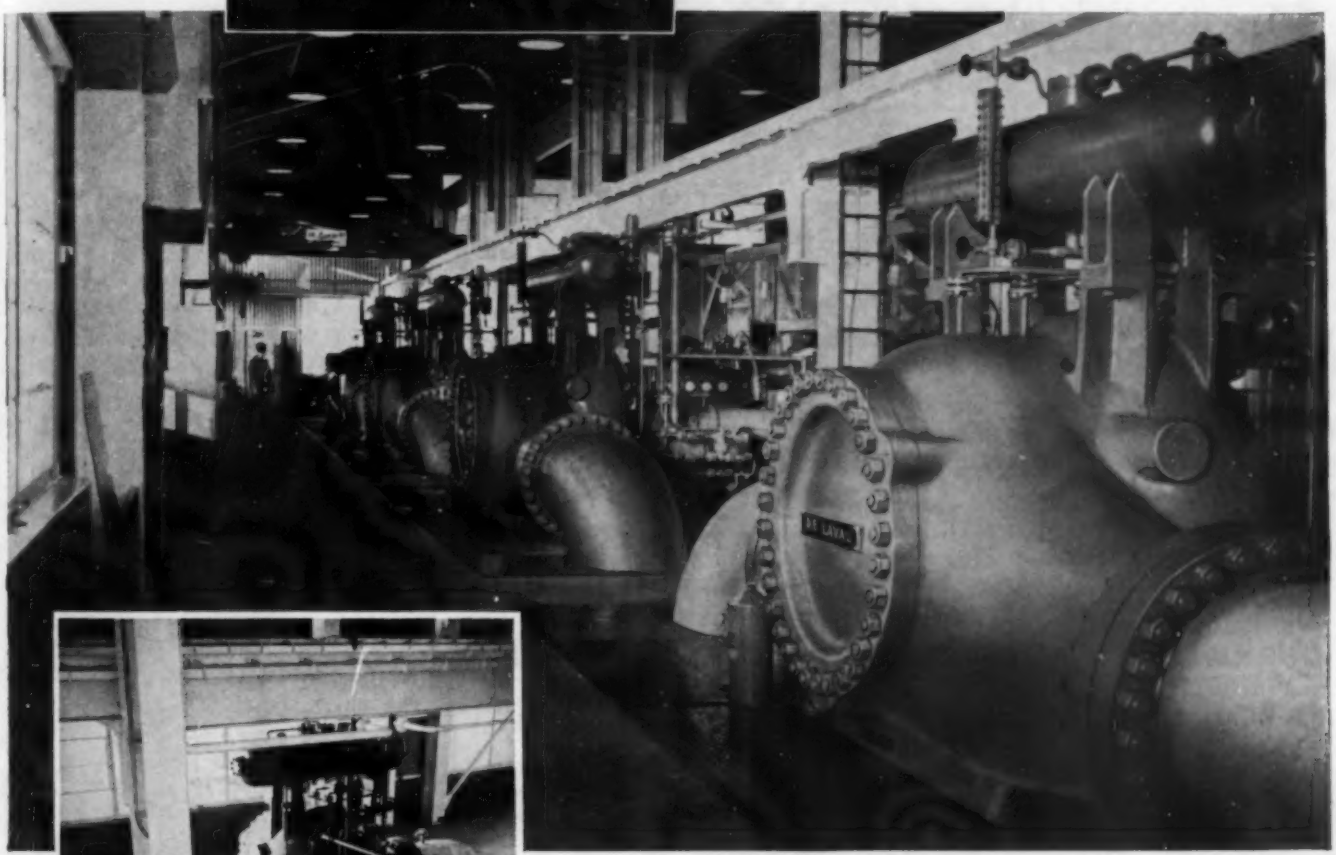
Trans-Canada is going ahead with plans to build an all-Canadian pipe line from the Alberta gas fields to eastern Canada. When this line is completed, TGT has agreed to purchase substantial quantities of gas in eastern Canada upon Trans-Canada's request.

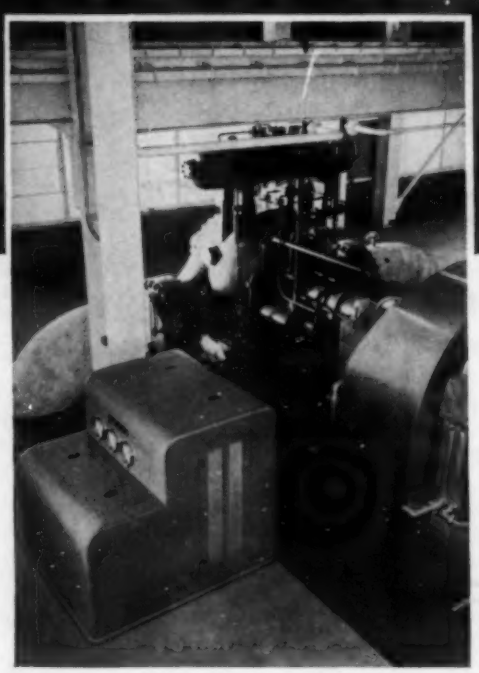
Work Nears Completion on Mid-Continent's Osage Line

Mid-Continent Pipe Line Company has completed work on the first section of its Osage County-Tulsa parallel. A 24-mile loop is now in the ground and work is well underway on a 10½-mile length of 8-inch between Hominy and Fairfax, Okla. Purchase of a 4-mile section of line by Mid-Continent completes the loop.

Looping of the Hominy-Tulsa line will increase Mid-Continent's capacity to deliver 33,000 barrels of crude per day to the D-X Sunray Oil Company refinery at Tulsa.

FOUR DE LAVAL CENTRIFUGAL COMPRESSORS *in Tescott, Kansas station of Northern Natural Gas*





For easy installation, De Laval pipeline compressors are designed in two packages: (1) The machine plus the emergency seal tank, (2) The auxiliary console which contains the filters, pumps, coolers and other accessories.

Here's more proof of the efficiency and dependability of De Laval centrifugal compressors for high pressure gas transmission. This Tescott, Kansas station of the Northern Natural Gas Co. has four De Laval centrifugal compressors in series.

The station flow is 930 M²SCFD, station inlet pressure 477 psig and discharge pressure 745 psig. *By changing the impeller and a few minor parts, these units can handle 1,100 to 1,200 M²SCFD.* Three identical De Laval compressors are on the job in the Macksville, Kansas station of Northern Natural.

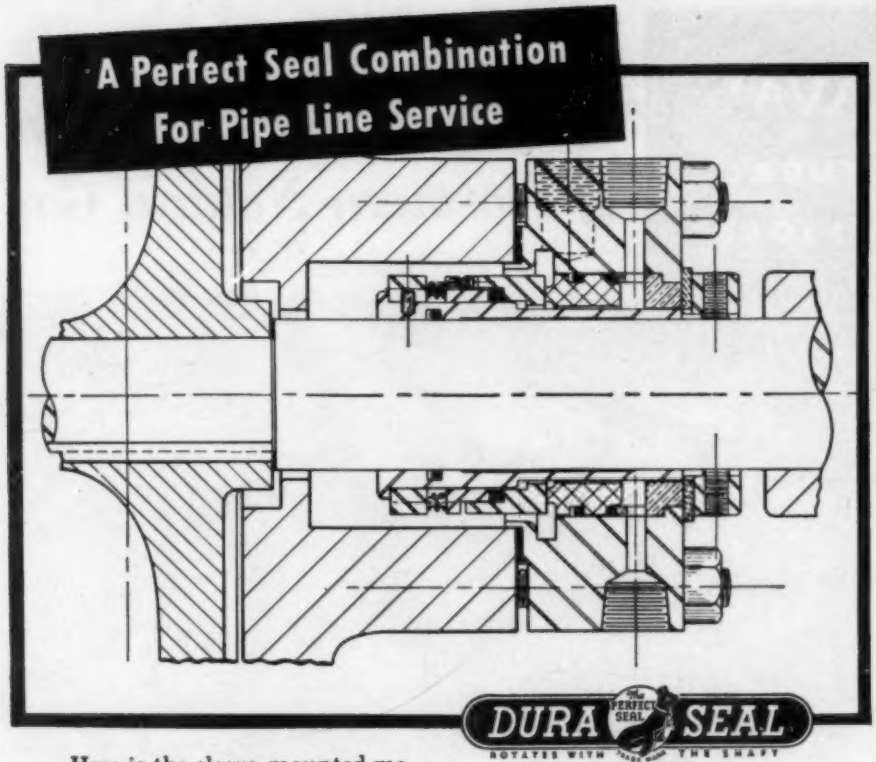
De Laval centrifugal compressors offer important engineering features. • Pressure contact shaft seal eliminates gas leakage. • Construction is heavy and rigid throughout. • Units have high load carrying capacity. De Laval units, totaling more than 200,000 hp, are now in operation on major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

DL509



Here is the sleeve-mounted mechanical seal "Package" assembly especially designed for multiple stage pumps on pipe line service. Easy to install from outer end of stuffing box . . . no special machining necessary

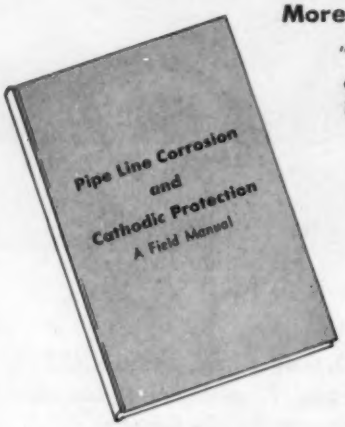
TYPE PTO

. . . no guesswork on setting the seals
. . . no blind adjustments required.
Write for further details . . . mention Dura Seal Type PTO.

DURAMETALLIC CORPORATION, *Kalamazoo, Michigan*

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

Send for your FREE copy of the New Petroleum Book Catalog which describes the nature and contents of many books pertaining to the Petroleum Industry.

ADDRESS:

Book Department
GULF PUBLISHING COMPANY
P. O. BOX 2608
HOUSTON 1, TEXAS

El Paso Files New Plan for California Line with FPC

In an effort to solve the many-sided problem of boosting gas deliveries to its California customers and coordinate it with construction of the Pacific Northwest line, El Paso Natural Gas Company has submitted a third alternate, Plan "D," to the FPC.

The new proposal differs slightly from one of three submitted earlier (see PIPE LINE INDUSTRY, June 1955, page 92). Under the newest plan, El Paso would deliver 100,000 Mcf per day to Southern California Gas Company and Southern Counties Gas Company of California at Blythe, Calif., instead of Topock, Ariz., as originally proposed. A second change would call for delivery of 250,000 Mcf per day to El Paso's California customers at Vernalis Junction in the Bay area rather than at Reno, Nev., as proposed earlier.

No change in volumes of gas to be delivered is involved, only points of delivery will be changed. Estimated cost of the proposed Mountain Home, Idaho, to Vernalis Junction line is $50,245,000.

Montana-Dakota Gets FPC OK for Dakota-Wyoming Lines

Montana-Dakota Utilities Company has been granted a certificate by the FPC authorizing construction of 44 miles of line and addition of 1090 compressor horsepower on its gas transmission system in South Dakota and Wyoming.

About 30½ miles of new line and 540 compressor horsepower will replace existing facilities in Harding and Butte counties, S. D., and Fallon County, Mont. Other new facilities include nine miles of line serving the Ellsworth Air Force Base near Rapid City, S. D., and about 4½ miles of line to Signal Oil and Gas Company's proposed desulfurization plant in Washakie County, Wyo.

Construction plans include, also, a 550-hp unit at Montana-Dakota's station in Hot Springs County, Wyo. In addition, the company plans to lease and operate an 880 hp unit to be installed by Montana-Wyoming Gas Pipe Line Company in its Worland, Wyo., compressor station.

Estimated cost of the Montana-Dakota additions is $1,414,218; those to be built by Montana-Wyoming, $522,697.

LADISH

Developments

FOR THE PIPE LINE INDUSTRY

● **3-R (EXTRA LONG RADIUS) ELBOWS**

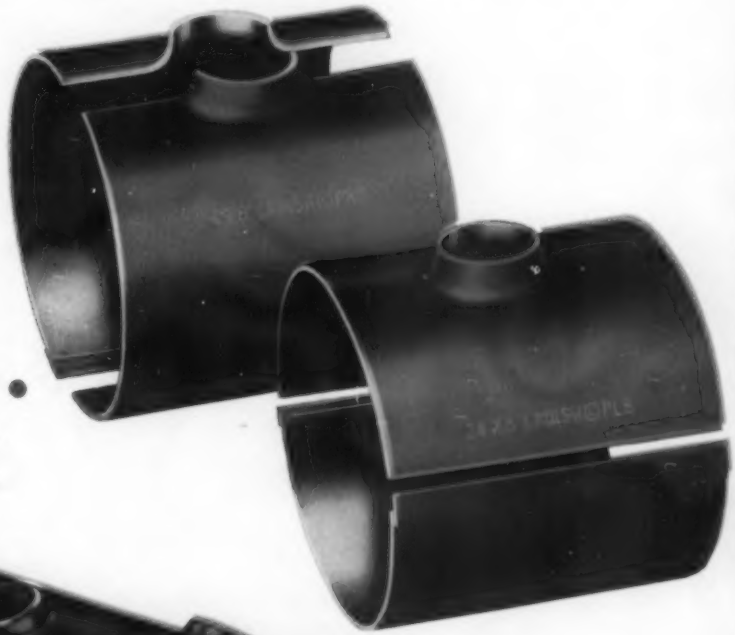
Special Fittings Designed from Field Research Solve the Industry's Unusual Piping Problems

Working closely with pipe line engineers, Ladish continues to pioneer fittings designed to simplify and improve transmission efficiency.

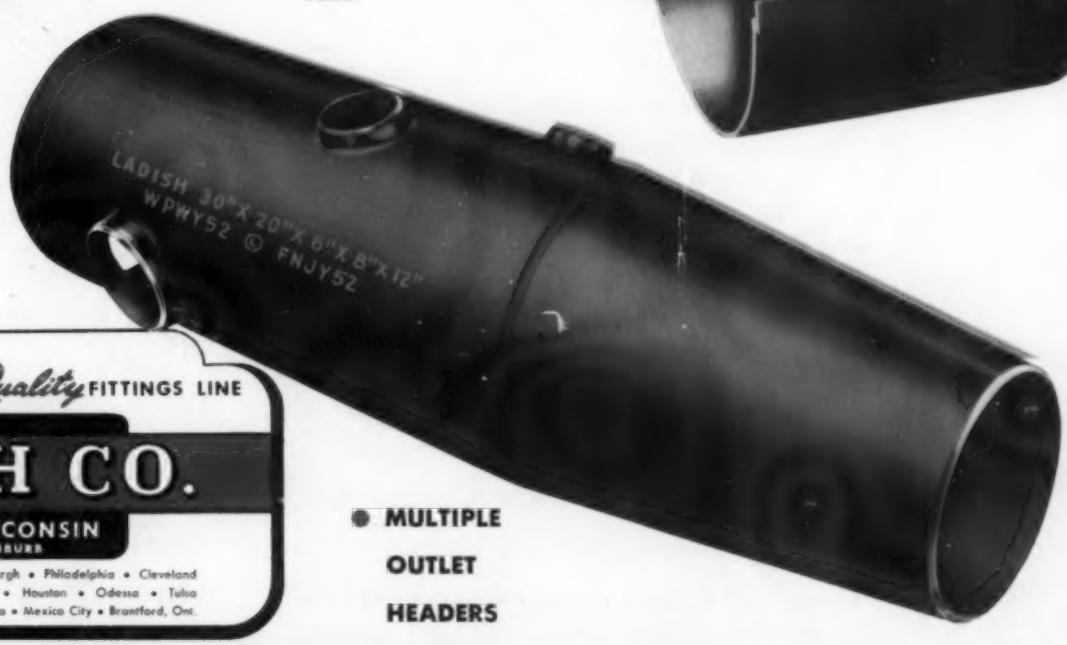
Notable examples are: 3-R Elbows to reduce frictional losses and to facilitate cleaning . . . Hot-Tap Reinforcing Tees in choice of designs to improve reinforcement of horizontal or vertical branch connections . . . Multiple Outlet Headers to reduce cost and simplify installation of gate settings . . . and Anchor Flanges to restrict pipe movement.

Reliability of all Ladish fittings is assured by unexcelled metallurgical standards of Controlled Quality.

● **ANCHOR FLANGES**



● **HOT-TAP REINFORCING TEES**



● **MULTIPLE OUTLET HEADERS**

L

TO MARK PROGRESS

THE COMPLETE *Controlled Quality* FITTINGS LINE

LADISH CO.

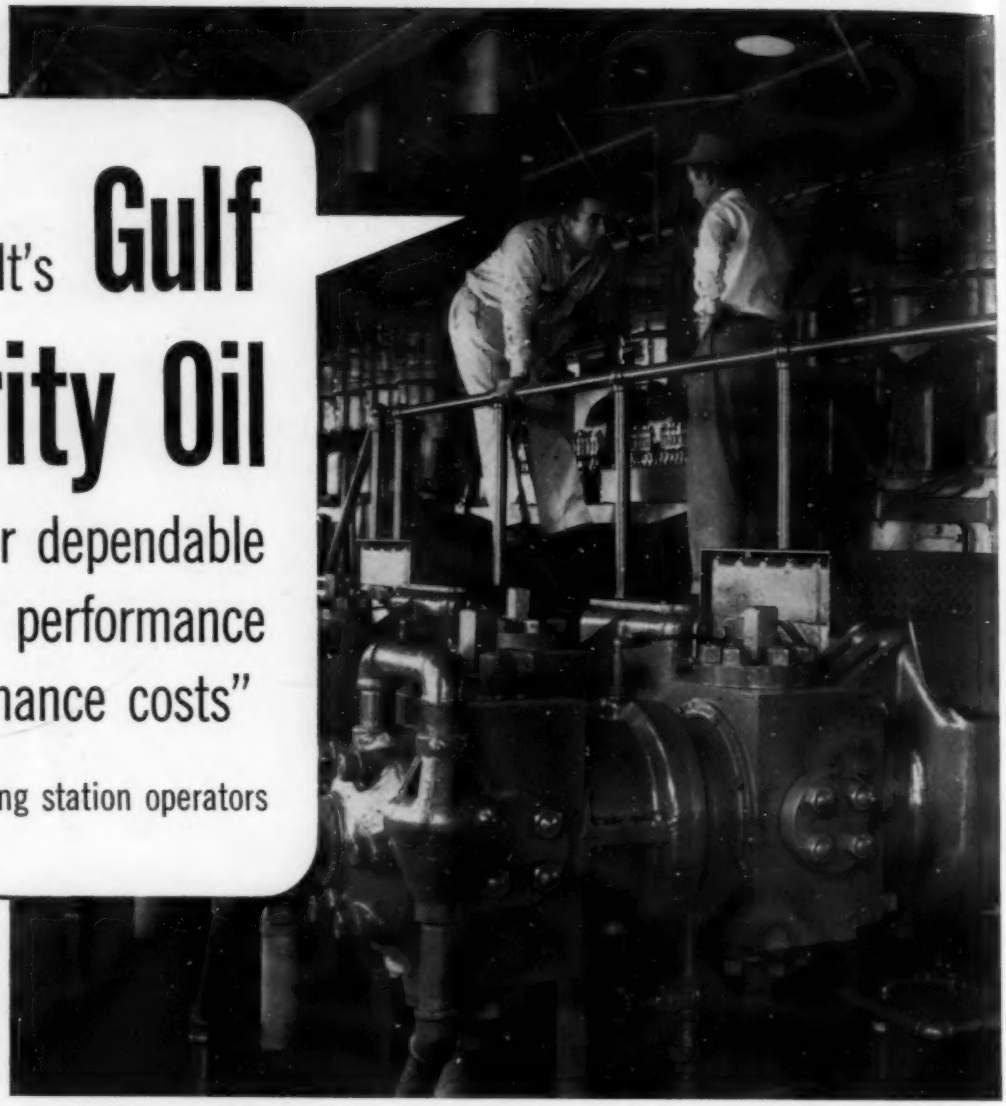
CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland
Chicago • St. Paul • St. Louis • Atlanta • Houston • Odessa • Tulsa
Los Angeles • San Francisco • Seattle • Havana • Mexico City • Brantford, Ont.

"It's Gulf Security Oil

for dependable gas compressor performance and low maintenance costs"

say pumping station operators



Smooth, continuous operation is a must for these units in service at a South Texas gas compressor plant. They are responsible for the steady flow of essential natural gas through pipe lines to homes and industries as far north as Detroit and New York. Gulf Security Oil provides the sure, effective protection needed for cylinders and bearings in both engines and compressors.

You can depend on Gulf Security Oil to provide the proper lubrication that is so important to vital compressor units if operating troubles are to be prevented and maintenance costs kept low.

Gulf Security Oil has a record of outstanding performance in scores of gas transmission plants. After years of operation with this quality oil, the cylinders and piston rings of both the compressors and power assemblies show negligible wear. And few carbon deposits have formed on power cylinder ports and pistons.

If you are installing new compressor units, or feel that you're not getting the most effective lubrication possible for your present units, it will certainly pay you to try Gulf Security Oil. Contact your nearest Gulf Office and have a Gulf Sales Engineer call.

Gulf Oil Corporation • Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PENNSYLVANIA

GULF

The finest petroleum products for your every need

Temporary Approval Given For 61-Mile El Paso Line

El Paso Natural Gas Company has been granted temporary authority by the Federal Power Commission to construct and operate approximately 61.6 miles of 14-inch line from Texas Hydrocarbon Company's Jameson plant in Coke County, Texas, to El Paso's Tex-Harvey compressor station in Midland County. They also have been authorized to construct an additional 880-horsepower compressor unit at the Tex-Harvey station and a purchase meter and check meter stations. Cost of the new construction is estimated at $2,225,000.

The facilities will enable El Paso to purchase approximately 60 million cubic feet of residue natural gas per day from the Texas Hydrocarbon Company. Concurrent with the El Paso authorization, the FPC granted Texas Hydrocarbon authority to deliver and sell the gas.

Washington, D. C. To Get New Gas Line

Washington Gas Light Company has been authorized by the FPC to lay 11 miles of 24-inch line and make a river crossing of the Anacostia river in the District of Columbia and Maryland.

New facilities will extend from Washington Gas' Chillum station in Maryland through its DC East Station to Gordon's Corner, Md. The line will augment the company's entire system including that in Virginia. Estimated cost of the project is $2 million.

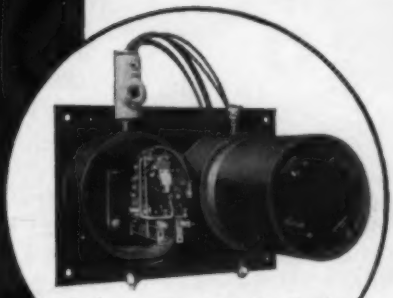
Northern Natural to Build Facilities in Texas, Iowa

Authorization to build pipe line facilities in Texas and Iowa to increase system capacity by 30,513,000 cubic feet of natural gas per day has been granted Northern Natural Gas Company by the FPC. Estimated to cost $760,600, new construction will include a 2000-horsepower compressor unit in Northern's Sunray, Texas, station and approximately 6½ miles of 6-inch pipe paralleling sections of existing line in Iowa.

Northern originally had proposed a larger project, including construction of facilities to import Canadian natural gas to supply customers in the Midwest. Hearings on this proposal were consolidated with hearing on several related proposals involv-

EC&M

50,000 KVA
Interrupting Capacity
MOTOR STARTERS


Enclosing covers on Overload Relays screwed on . . . give quick access.

OUTSTANDING ADVANTAGES

1. Reduced floor space
2. Low-cost Div. 2 design
3. 50,000 KVA interrupting capacity
4. Combination starter with Disconnect Switches
5. Corrosion resistant, weatherproof construction
6. Copper tungsten contacts for positive operation
7. Simple 3-wire TIME-DELAY UVP push button circuit
8. THERMAL-MAGNETIC Overload Relays give accurate motor protection . . . trip instantly on faults
9. All internal wiring complete

1914

Petroleum engineers specify these starters for Division 2 semi-hazardous locations because they assure substantial savings in installation and operation.

Construction advantages include: drip-proof roof . . . tank-cover and front cubicle doors . . . oil switch which opens 220-volt control transformer before upper door can be opened to operate main line disconnects . . . hermetically sealed control circuit contacts . . . main contactor with alloy contacts oil-immersed in rear tank. On voltage dips, push button circuit maintained up to 2 seconds by simple 3-wire circuit, permits opening of "stop" circuit without delay.

EC&M 2200-5000 volt Starters are also available in Division 1 style for Class 1, Group D Hazardous Locations. For interrupting capacities above 50,000 KVA, EC&M VALIMITOR (volt-ampere-limitor) Starters are furnished in both Division 1 and Division 2 construction.

Write for 16-page Booklet 1062 for complete details.

THE ELECTRIC CONTROLLER & MFG. COMPANY

4498 LEE ROAD CLEVELAND 28, OHIO

For more data on advertised products, use Readers' Service Cards, last page.

ing an expansion of Northern's system, and, in June, when hearings were resumed, the FPC said, it became apparent Northern could not obtain natural gas from Canada for the coming winter season. Consequently, the company proposed to construct facilities to meet only part of the demand for gas on its system.

Northern plans to supply the remaining demands for gas on its system during the 1956-57 winter season, and will file new and amendatory or supplemental applications covering that proposed service. In addition to the import of Canadian gas, these applications will relate, among others, to an extension of Northern's system from a point near Sioux Falls, S. D., to Aberdeen, S. D.

United Gas To Add 63 Miles of Line

A recent FPC order gives United Gas Pipe Line Company temporary authority to add 63 miles of pipe line and 330 compressor horsepower to its system in Mississippi, Alabama and Florida. Cost of the expansion is estimated at $8.4 million.

Southern Natural Receives Temporary FPC Approval

The Federal Power Commission recently granted Southern Natural Gas Company temporary authorization to construct natural gas facilities estimated to cost over $2 million. Included in the construction program are 24.7 miles of pipe line to increase delivery capacity of branch or lateral lines, which includes replacement of 5.5 miles of line near Atlanta; addition of 4590-horsepower in two existing compressor stations and construction of 16.2 miles of pipe line; and construction of 7.5 miles of line to connect existing facilities with a new gas supply from Patterson field, St. Mary Parish, Louisiana.

The certificate does not authorize Southern's proposed line taps and meters for Shannon and Plainville, Georgia.

Cleveland "140" speeds relocation of 12-inch gas line to new bridge across Rio Grande River

MERMIS CONSTRUCTION COMPANY'S Model 140 Cleveland Trencher is doing a fast job of cutting 3,000 feet of trench, 2 feet wide by 4 feet deep, for the relocation of a 12-inch gas line to cross the Rio Grande River on a new bridge near Albuquerque, New Mexico. The job is being done for the Southern Union Gas Company. This Cleveland—the standard trencher for work from 18 to 30 inches wide down to 5½ feet deep—has been an outstanding performer on trenching jobs of all types, from big cross-country pipelines to small diameter utilities distribution lines. Get the full story from your Cleveland distributor. THE CLEVELAND TRENCHER CO., 20100 St. Clair Ave., Cleveland 17, Ohio.

(Adv.

made for rugged use...
in plant—office or field

Gotkool
water cans and coolers

"GOTKOOL" Water Cans are easily portable for field use... and **"GOTKOOL" Water Coolers** are especially designed for use in office, store, or plant. Both have extra large top openings. Snug-fitting, easily removable tops protect water from impurities. Heavy construction with heavy double-locked, sweat-soldered seams. *Buy* **"GOTKOOL"** *at your supply store today.*

GOTKOOL Water Cooler — made in 2, 3, 5, 8, 10, 15, and 20-gallon sizes with extended or recessed flush-mounted faucet optional. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

GOTKOOL Water Can — made in 1½, 2, 3, 5, 10, and 20-gallon sizes without faucets. Extended or recessed flush-mounted faucets available at slight additional cost. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

KEEP PURE DRINKING WATER ALWAYS HANDY

PIPE LINE INDUSTRY

"One of the fellows is trapped in the pipe, and they want to know if they should blow the line out or cut it open."

NEW!

SEND FOR THIS

12-PAGE BULLETIN D-1L

JUST OFF THE PRESS

This bulletin contains specifications, engineering and performance data, photos and descriptions of recommended types of filter media, check list of liquids that can be filtered and other helpful data.

- CUTAWAY DRAWINGS
- LIST OF LIQUIDS THAT CAN BE FILTERED
- GENERAL SPECIFICATIONS
- PERFORMANCE DATA
- TYPES OF FILTERING MEDIA
- INSTALLATION PHOTOS AND DATA
- PROJECT DATA SHEET

DOLLINGER MFG. PROTECTOMOTOR AND STAYNEW FILTERS

DOLLINGER CORPORATION

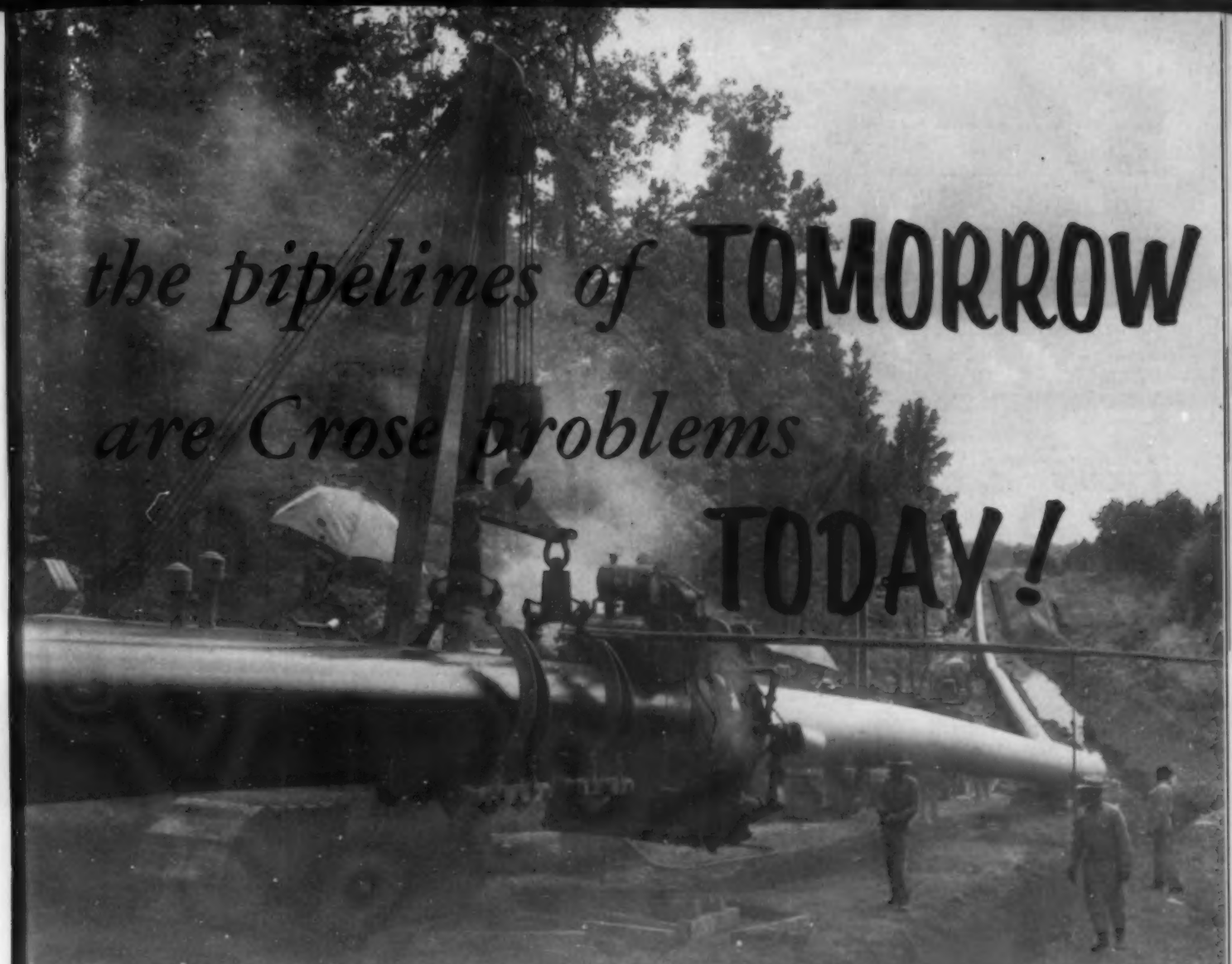
95 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

For more data on advertised products, use Readers' Service Cards, last page.

Pipe Line Contracts Not Let

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alabama-Tennessee Natural Gas Co.—Florence, Ala.	25	8, 12	Gas	Colbert County, Ala. loop.	$808,450	3.7 miles authorized
American Gilsonite Co.	80	....	Gilsonite Slurry	Bonanza, Utah—Western Colorado, refinery	.....	Planned
American Pipe Line Corp.—New York City (Swinerton & Walberg, Engineering)	1,425 plus 485 miles feeders & distribution lines	24, 26	Products	Beaumont, Texas area—Newark, N.J.	$170 million	Approved ODM
Arkansas-Louisiana Gas Co.	66	24	Gas	Arkansas, Louisiana and Texas loops	$9,245,166	Authorized
Ar-Mex Pipe Line Co.	900	8, 12, 14	Crude	Guernsey, Wyo.—Phoenix, Ariz.	$31 million	Planned
H. W. Bass & Sons, Inc.	152	4, 6	LPG	Live Oak County, Texas—Corpus Christi, Texas	.....	Planned
Bell Oil and Gas Co.	140	6-8	Products	Ardmore—Cushing, Okla.	.....	Planned
Big Horn Pipe Line Co.—Cheyenne, Wyo.	150	8	Crude	Ash Creek, Wyo. field—Midwest, Wyo.	.....	Planned
California-Oregon Pipe Line System	103	6	Crude	Crescent City, Calif.—Medford, Ore.	$2 million	Planned
Carolina Natural Gas Corp.—701 Wilder Bldg., Charlotte, N.C.	185	2, 12	Gas	North and South Carolina	.....	Proposed
Central Hudson Gas & Electric Co.	48	12	Gas	Albany—Kingston, N.Y.	.....	Applied to FPC
Cities Service Gas Co.—1st National Bank Bldg., Oklahoma City, Okla.	33	20, 26	Gas	To replace lines in Kansas and Missouri	$1,860,000	Authorized
	13	....	Gas	Lafayette County, Kansas	$285,000	Authorized
	15.5	16	Gas	Carter County—Garvin County, Okla.	$541,050	Authorized
Clinchfield Coal Corp.—Dante, Va.	16	12	Gas	Dickenson County, Va.—Osborne Gap, Ky.	$785,000	Authorized
Coastal Transmission Corp.—Houston, Texas	500	30	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas.	$110 million	Considered
Coast Counties Gas & Electric Co.—369 Pine St., San Francisco	40	3, 4, 8	Gas	Coast and Valley region, Calif.	.....	Planned
Colorado Interstate Gas Co.	115	4, 6, 8	Gas	Denver—Julesburg Basin—Basin Cities	.....	Before FPC
	328	16, 18	Gas	LaPlata County—Pueblo, Colorado Springs and Denver	$21,600,000	Authorized
Compania del Oleoducto Buenaventura—Cali, Colombia, S.A.	90	....	Products	Buenaventura—Cali, Colombia, S.A.	$4 million	Planned
Consolidated Gathering Systems, Ltd.	198	....	Crude	Sturgeon Field—Edmonton.	.....	Planned
Consolidated Natural Gas Corp.—New York	112	....	Gas	In Ohio—Plus other smaller lines	$6 million	Planned
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border	.....	Planned
Dixie Pipe Line Co.	20	8	Gas	Gwinville Field, Miss.—Transcontinental Gas line	$425,000	Authorized
El Paso Natural Gas Co.—El Paso, Tex.	32.5	10	Gas	Reagan and Upton counties, Texas	$799,000	Authorized
	370	....	Gas	Mountain Home, Idaho—Reno, Nev.	$35 million	Proposed FPC
	500	34	Gas	Parallel from San Juan Basin to Topock, Ariz.	.....	Proposed FPC Alternate
	....	30	Gas	Pendleton, Ore.—Calif.	.....	Proposed FPC Alternate
	....	....	Gas	Mountain Home, Idaho—Vernalis Junction, Calif.	$50 million	Before FPC Alternate
	31.9	8	Gas	Pinal County, Ariz. Service Line.	.....	Before FPC
	119	3-6	LPG	Bloomington—Gallup, N.M.	.....	Planned
	62	14	Gas	Coke County—Midland County, Texas	$2.25 million	Authorized
Empresa Nacional del Petroleo	80	6	Products	Concon—Santiago, Chile	.....	Planned
Governments of Southern Rhodesia and Portuguese South Africa	200	....	Products	Beria, Portuguese Mozambique—Umtalia, Southern Rhodesia	.....	Considered
Hope Natural Gas Co.—445 W. Main St., Clarksburg, W. Va.	33	8, 10, 12	Gas	Wyoming County, W. Va.—Buchanan County, Va.	.....	Proposed
Houston Texas Gas & Oil Co.—4604 Main St., Houston	1042	18, 24, 36	Gas	Louisiana—Miami, Fla.	$110 million	Considered
Idaho Natural Gas Co.—Goodland, Kansas	....	....	Gas	Pacific Northwest line—points in Southern Idaho	.....	Proposed
International Pipe Line Co., Inc.—227 N. Colfax Ave., Minneapolis, Minn.	132	8	Products	Wrenshall, Minn.—Minneapolis Bulk Terminal	$4,250,000	Planned
Iraq Petroleum Co.	75	24	Crude	Homs, Syria to Tripoli	.....	Proposed
Lateral Gas Pipe Line Co.—Cedar Rapids, Iowa	27	4	Gas	Grant—Clarinda, Iowa	$267,000	Proposed
Lone Star Gas Co.—Dallas	230	22, 26	Gas	Cotton County, Okla.—Fritch, Texas	$18.7 million	Before FPC
	205	....	Gas	Snyder, Texas to tie in with Cotton County, Okla.—Fritch, Texas line	.....	Before FPC
Malco Pipe Line, Inc.	91	6	Products	Prewitt, N.M.—Albuquerque	$1,250,000	Planned
Manufacturers, Gas, Light, and Heat Co.	72	16-20	Gas	Doddridge, Wetzel, and Marshall Counties, W. Va.	.....	Planned
	213	3-26	Gas	Various locations in Pa., W. Va., and Ohio	.....	Planned
	40	....	Gas	Allegheny, Washington, and Beaver Counties, Pa.	.....	Planned
Mayflower Pipe Line Co.-(Pine Tree Natural Gas Co.)—70 Pine St., New York, N.Y.	200	....	Products	New Jersey refining area—New England	.....	Planned
Michi, Inc.	222	10	Crude	Highland, Ind.—Alma, Mich.	.....	Planned
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	252	4-24	Gas	Various locations in Illinois and Wisconsin	$11 million	Proposed
Mississippi River Fuel Corp.	190	10-18	Gas	Laterals in Woodlawn and Waskom Gas Fields, Texas	.....	Planned
Missouri Central Gas Co.	25	6	Gas	Moberly—Macon, Mo.	.....	Proposed
Missouri Public Service Co.—Warrensburg, Mo.	136.4	8-10	Gas	New Franklin, Mo.—Grundy County, plus laterals	$5 million	Proposed
Montana-Dakota Utilities Co.—Minneapolis	56	2, 4, 6	Gas	Hettinger and Stark counties, N.D.	$728,854	Authorized
	44	....	Gas	Various locations in S.D. and Wyoming	$1,414,200	Authorized
Moore-Stoner Co.	200	6	Products	Glendive, Mont.—Minot, N.D.	$2.5 million	Planned
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors, 425 miles let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Before FPC
Natural Gas Producers, Inc.—Colorado Springs	61.8	12	Gas	Yenter Pool—Denver	$1,374,000	Planned
	49	10	Gas	Denver-Julesburg Basin—Fort Morgan, Brush and Denver	.....	Planned
Natural Gas Storage Co. of Illinois—Chicago	31	36	Gas	Delivery from Herscher, Ill. storage field.	$7 million	Authorized
Nebraska Pipe Line Co.	220	6	Products	Cheyenne, Wyo.—North Platte, Neb.	$4 million	ODM certificate granted
Nevada Natural Gas Co.	114	12, 16	Gas	Various loops along Needles, Calif.-Las Vegas, Nev. line	$2.5 million	Planned
New River Gas Co.	50	....	Gas	Summers-Monroe Counties, W. Va. and Narrows and Dublin, W. Va.	.....	Planned
New York State Natural Gas Corp.	56.5	30	Gas	Tioga County, N.Y.	.....	Before FPC
NNCW Pipe Line Co.—Dallas, Texas	127	8, 10	Crude	Clareton Field—Casper, Wyo.	$3.6 million	Planned
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	329	2, 12	Gas	Sioux Falls to Aberdeen, S.D.	$6,661,100	Proposed
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
	403	24, 30	Gas	Emerson, Manitoba, Canada—Farmington, Minn.	$32,813,000	Before FPC
	28.4	30	Gas	Test lines to underground storage near Redfield, Iowa	$4.8 million	Before FPC
Northwestern Utilities, Ltd.—10124-104th St., Edmonton, Alberta, Canada	42	12	Gas	Bonnie Glen—Edmonton, Alberta	$1.4 million	Proposed
Ohio Fuel Gas Co.	18.9	16	Gas	Hardin and Allen Counties, Ohio	$792,400	Authorized
Pacific Gas & Electric Co.	190	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$4 million	Proposed
Pacific Northwest Pipe Line Corp.—M & M Bldg., Houston	1466 plus 443	22, 26	Gas	San Juan Basin—Pacific Northwestern states	$163 million	Contracts let for 1221 miles
Panhandle Eastern Pipe Line Co.	58	16	Gas	Springfield—Peoria—Illinois Loop	.....	Before FPC
Pawnee Pipe Line Co.	15	8	Crude	Northeast Colorado Sector—Denver-Julesburg, Basin	.....	Planned
Permian Basin Pipe Line Co.	11	6	Gas	Lea County, N.M.	.....	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	200	6, 8	Products	Lagos, Mexico—Guadalajara, Aguascalientes and Salamanca	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
Phillips Petroleum Co.—Bartlesville	54	6	Products	Goldsmith—Borger, Texas	.....	Planned
	50	....	Ethylene	Sweeny—Pasadena, Texas	.....	Planned
Pittsburgh Consolidation Coal Co.—Pittsburgh	108	....	Coal	Georgetown—Eastlake, Ohio	.....	Eng. Underway
S. & M. Pipe Line Co., Ltd.	100	8, 10	Crude	Midale, Forbisher, Steelman, Lampman, Alida, and Nottingham, Sask. to Crome, Manitoba	.....	Proposed



the pipelines of TOMORROW *are Crose problems* TODAY!

Crose engineering and research is constantly working to develop new and better pipeline construction equipment. The 36″ cleaning and priming machines — coating and wrapping machines used on the Transcontinental Gas Pipeline job were the result of Crose engineering and research. The machines, largest of their kind, show the forward thinking of Crose designers. Whatever equipment tomorrow's pipelines will demand — you can bet that Crose will build it.

m.j. Crose

Manufacturing Company, Inc.

2715 DAWSON ROAD
PHONE MAdison 6-2172
TULSA, OKLAHOMA

15225 EAST COLFAX AVENUE, AURORA, COLORADO
500 FIFTH AVENUE, NEW YORK CITY
DISTRIBUTORS:
CROSE-CURRAN LTD., EDMONTON
CROSE PIPELINE EQUIPMENT CO., INC., NEWARK, N. J.
PIPELINE SUPPLY CO., HOUSTON

Pipe Line Contracts Not Let—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Salt Lake Pipe Line Co.	....	....	Products	El Paso, Texas—Albuquerque, N.M.	$4 million	Planned
	82	....	Crude	Loop on Rangely—Salt Lake City line	.....	Planned
Santos Jundiai Railway Co.—Brazil	....	8, 14, 22	Crude & Products	Expansion of Santos—Sao Paulo system	$5 million	Planned
Shamrock Pipe Line Corp.	100	6	Products	Amarillo—Abernathy, Texas	.....	Planned
Shell Pipe Line Corp.	22	6	Crude	Ropes Field, Texas	.....	Proposed
	15	4	Crude	Brahaney Field, Texas	.....	Proposed
Southern Calif. Gas Co. and Southern Counties Gas Co.	278	30	Gas	Topock, Ariz.—Los Angeles	$31 million	Planned
Southern Natural Gas Company	39	....	Gas	Various Lines in Mississippi	$2.2 million	Authorized
Southern Pacific Pipe Lines, Inc., San Francisco	61	16	Products	Colton—Watson, Calif.	.....	Contracts have been let for 827 miles
Standard Pipe Line Co.	350	16	Crude	Glendive, Mont.—Guernsey, Wyo.	.....	Before ODM
	330	16	Crude	Wink, Texas—Albuquerque, N.M.	.....	Before ODM
Sturgeon Pipe Line, Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sunflower Pipe Line Co.—Tulsa, Okla.	265	3-6	LPG	Kearny, Grant and Haskel Counties, Kansas—Wichita, Kansas	$3.5 million	Authorized
Tennessee Gas Transmission Co.—Box 2511, Houston	220	26, 30	Gas	Loops in Kentucky and Ohio plus 376 miles of Supply laterals in Texas and Louisiana	$56 million	Before FPC
Tennessee Gas Transmission Company	1,050	....	Gas	Border near Emerson, Manitoba—Nashville, Tenn.	.....	Proposed
Texas Eastern Transmission Corp. and Texas Eastern, Penn-Jersey Corp.	11	....	Gas	Loops in Philadelphia area plus compressor facilities	$2.4 million	Authorized
Texas Gas Transmission Corp.	198	20	Gas	East Lake Palourde, La.—main trans. line	$20 million	Before FPC
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2240	30, 36	Gas	Alberta—Eastern Canada	$297 million	Planned
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
	27	....	Gas	Loops in La., Ga., N.C., Va., and Md.	$3,426,000	Authorized
Trans-Prairie Pipelines, Ltd.	24.5	3, 4, 6	Crude	Gathering lines in Midale, Forbisher and Alida oil fields, Canada	.....	Proposed
Triangle Pipe Line Co.	560	12	Products	Arkansas City, Ark.—Covington, Ky.	$24.5 million	Proposed
Trunkline Gas Co.	24	....	Gas	Eight new compressor stations and loops	$18.7 million	Authorized
Union Gas Co. of Canada, Ltd.—Chatham, Ontario	180	24	Gas	Dawn Gas Field to Lamberton County to deliver gas to Dominion Gas Co.	.....	Planned
Union Oil Co. of Calif.	815	....	Shale oil Products	Rifle, Colo.—Los Angeles	$56 million	Planned
United Gas Pipe Line Co.	63	16, 20	Gas	Various locations in Miss., Ala. and Florida	$8.3 million	Authorized
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Dept. of Defense	97	....	Crude	Elk Hills Naval Reserve—Los Angeles	$8 million	Considered
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Utah Natural Gas Co.	40	16	Gas	Orem—Salt Lake City, Utah	.....	Planned
Virginia Natural Gas Co.	153	....	Gas	Buckingham—Richmond and Portsmouth, Va.	.....	Planned
Warren Petroleum Co.	54	4-30	Gas	Lea County, N.M.	.....	Planned
West Coast Pipe Line Co.—Mercantile Bank Bldg., Dallas	960	24, 26	Crude	Wink, Texas—Norwalk, Calif.	$106 million	Planned
Westcoast Transmission Company, Ltd.	650	30	Gas	Peace River Fields—Sumas, Wash. Connecting with Pacific Northwest Pipeline—Second Line	$140 million	Planned
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Wyoming Gas Products Corp.	....	....	Gas	Gathering system in Weston County, Wyo. to feed gasoline plant	.....	Planned
Yacimientos Petroliferos Fiscales Bolivianos	170	4	Crude	Bermejo—Tupinza, Bolivia	.....	Planned

H. B. ZACHRY CO.

General Contractors

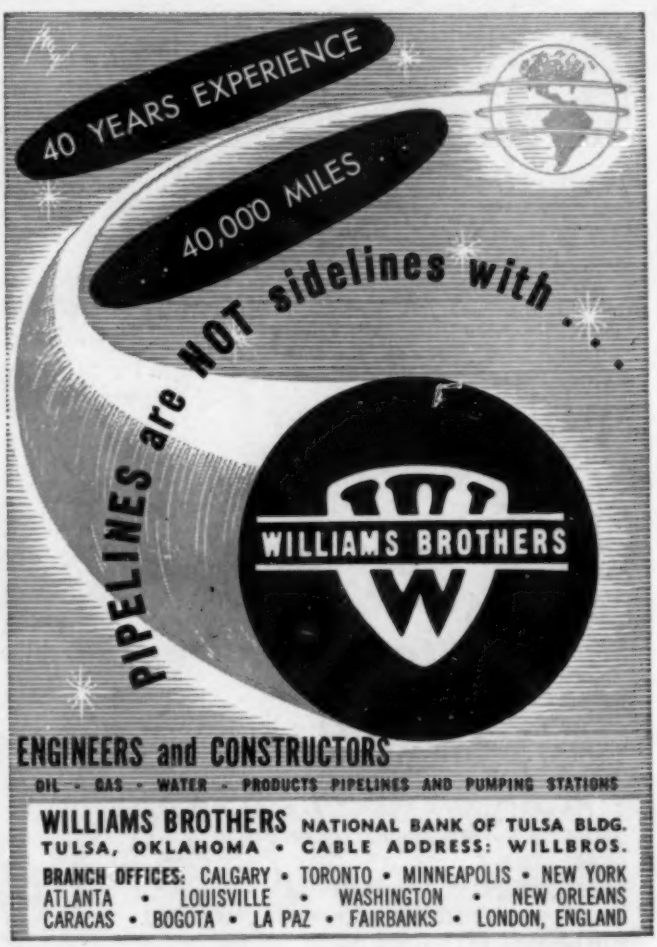
PIPE LINE DEPARTMENT TRANSIT TOWER
SAN ANTONIO, TEXAS
Phone: CApitol 6-2472

Skill, Integrity and Responsibility

Constructors of

PIPE LINES

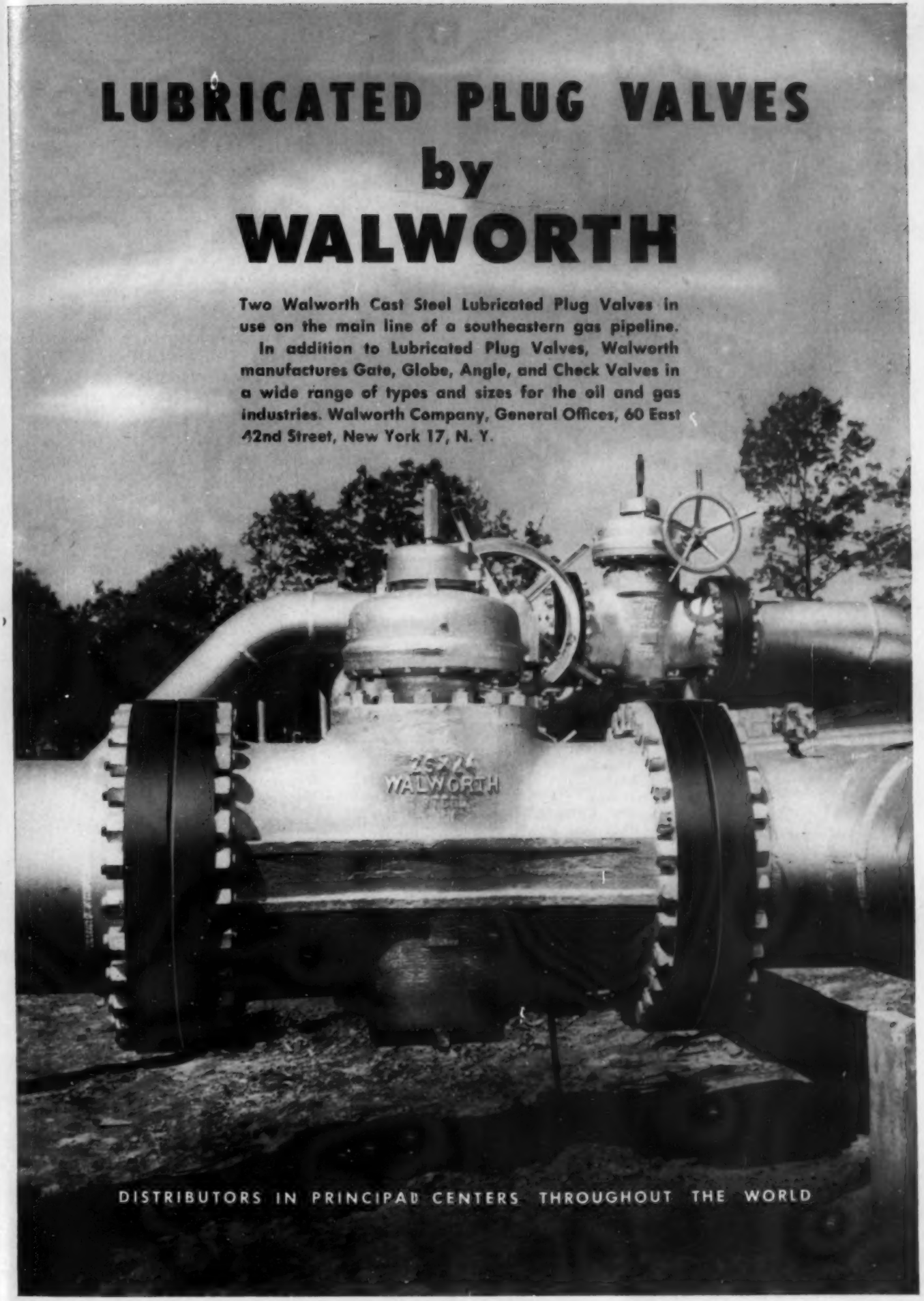
Oil Field Stations Electrical Installations


40 YEARS EXPERIENCE
40,000 MILES
PIPELINES are NOT sidelines with . . .
WILLIAMS BROTHERS
ENGINEERS and CONSTRUCTORS
OIL • GAS • WATER • PRODUCTS PIPELINES AND PUMPING STATIONS
WILLIAMS BROTHERS NATIONAL BANK OF TULSA BLDG.
TULSA, OKLAHOMA • CABLE ADDRESS: WILLBROS.
BRANCH OFFICES: CALGARY • TORONTO • MINNEAPOLIS • NEW YORK
ATLANTA • LOUISVILLE • WASHINGTON • NEW ORLEANS
CARACAS • BOGOTA • LA PAZ • FAIRBANKS • LONDON, ENGLAND

LUBRICATED PLUG VALVES by WALWORTH

Two Walworth Cast Steel Lubricated Plug Valves in use on the main line of a southeastern gas pipeline.

In addition to Lubricated Plug Valves, Walworth manufactures Gate, Globe, Angle, and Check Valves in a wide range of types and sizes for the oil and gas industries. Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

the WRENCH we made for YOU

Lowell #50-A Reversible Ratchet Wrench

for speedy installation of pipe line mechanical joints.

Reversible ratchet allows fastest possible tightening of 5/8" hex bolts —special 8" handle assures correct torque, as suggested in American Standard Specifications.

Ask your local industrial distributor for the #50-A Wrench by *Lowell* – makers of industrial wrenches for more than 85 years

or write direct to

LOWELL WRENCH CO.
WORCESTER 8, MASS.

Pipe Line Men

IN THE NEWS

S. L. Westlake

F. G. White

Magnolia Pipe Line Company has appointed **Stanley L. Westlake** chief engineer and **F. G. White** division superintendent of the Northern division headquartered at Oklahoma City.

Westlake, who succeeds the late John G. Norton, joined Magnolia after serving as special pipe line consultant for the Petroleum Administration for War and as engineer for various other pipe line companies.

White, who succeeds O. M. Joy, moves up from assistant division superintendent. A veteran of 34 years with the company, he has served in supervisory capacities at Brownfield and Luling, Texas, and at Salem, Ill.

•

Three **Lone Star Gas Company** Pipe Line department employes who have received promotions are **Herman Dempsey,** formerly foreman of the Fort Worth Pipe Line district, named assistant superintendent, with headquarters in Dallas. He succeeds **J. N. Carpenter,** recently promoted to superintendent. **Earl Miller,** formerly construction foreman in charge of the No. 1 construction crew with headquarters at Irving, succeeds Dempsey as foreman of the Fort Worth district. He will have headquarters in North Fort Worth. **Marvin Story,** formerly construction supervisor, succeeds Miller. He will continue to headquarter at Irving.

•

J. G. Spratt, president of the **Trans-Mountain Pipe Line Company,** Vancouver, has been named vice president and managing director of Triad Oil Company, Ltd. Formerly president of Anglo-Canadian Oil company, he was named president of Trans-Mountain in 1954.

Allen B. Hiatt has joined **Pacific Northwest Pipe Line Corporation** of Houston as assistant to the president after 25 years in the natural gasoline and natural gas business. He formerly was with Phillips Petroleum Company.

•

Ben H. Powell, Jr., has been elected vice president and general counsel and a member of the board of directors of **Brown & Root, Inc.,** Houston construction firm. As Brown & Root's chief legal counsel for some years, he was a member of the Austin law firm of Powell, Wirtz, Rauhut and McGinnis. The firm will continue to represent the construction firm.

•

The Buckeye Pipe Line Company recently announced the appointment of **George E. Pierce** as controller. Before joining Buckeye, Pierce was controller of Rockwood & Company, and prior to that, was with Dempster Mill Manufacturing Company and Standard Brands Inc. He also is a former special agent of the Federal Bureau of Investigation.

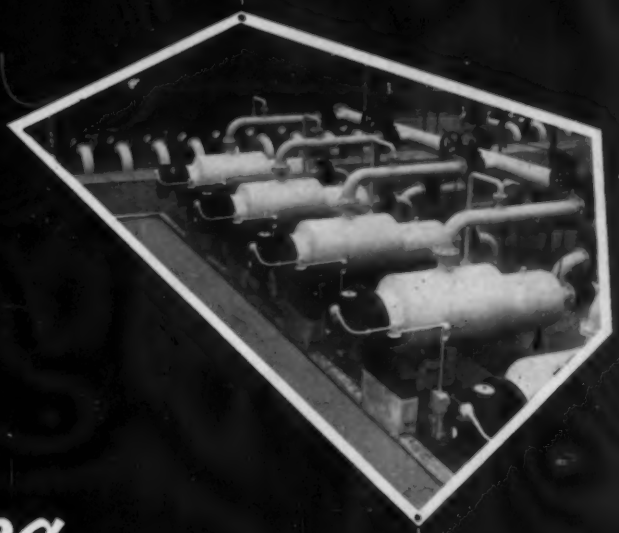
George E. Pierce

•

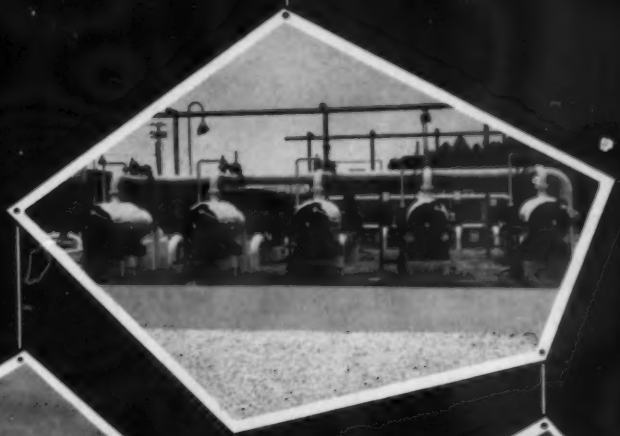
The elevation of two **Pacific Gas and Electric Company** executives to vice president has been announced.

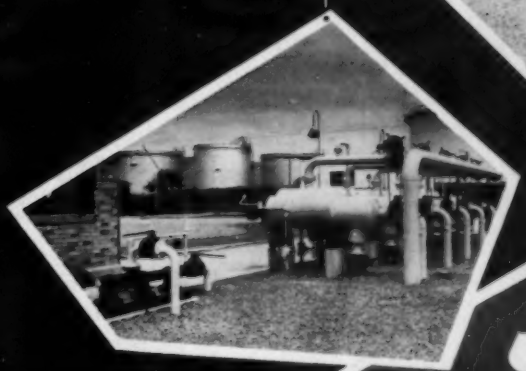
Shermer L. Sibley, an engineer and assistant to the president and general manager, was appointed vice president and assistant general manager. **Robert R. Gros,** manager of advertising and publicity, was appointed vice president, with responsibility for informational activities and special assignments by the president.

Sibley was employed by P. G. and E. in 1936 as a mapper and estimator. In 1946 he was promoted to the general office as an office assistant in the department of the vice president and general manager, and was named to his previous position in 1954. Gros joined Pacific Gas and Electric in 1937.



there's a new angle on straining pipeline products





JET TYPE self-cleaning pipeline strainers

When strainers are needed most – a period of about 30 minutes while a scraper is being received – conventional strainers "blind" so quickly that they are of little benefit since they must be cleaned manually and time does not permit this operation. But Jet Type Strainers may be cleaned so rapidly that they can be returned to service **in a matter of minutes,** assuring a continuous flow of clean product through the meters or to storage. Bypassing is eliminated, consequently there is no damage to meters, pumps, seals, dehydrators, etc.

THORNHILL UNIFLOW CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

Please send for Bulletin No. PL-540.

"clean all of the product .... all the time"

Don C. Russell, division manager, **Kaw Pipe Line Company,** recently was named state co-chairman for central-western Kansas by the Kansas State Oil Industry Information Committee. He succeeds W. D. Maxwell, Carter Oil Company, who was transferred to Shreveport.

Russell, also a member of the board of directors of Kaw Pipe Line, joined the company in 1935 as assistant construction manager of the company's original system. In 1936 he was appointed district superintendent with headquarters at Russell, Kansas, serving until 1946 when he was made division manager.

•

Southern Pacific Pipe Lines, Inc., has named **M. A. Levy** superintendent of Products Movements. His headquarters will be in Los Angeles. **B. K. Smith** has been appointed assistant general manager of Southern Pacific Pipe Lines, also with headquarters in Los Angeles.

Appointment of **Fred H. McIntire** as assistant to the president of **American Louisiana Pipe Line Company** recently was announced. He will serve as director of personnel for American Louisiana, a newly-formed company which will construct a $130 million natural gas pipe line from southern Louisiana to Detroit.

Fred H. McIntire

McIntire was employed by oil and gas producing companies in the Southwest prior to entering government service with the Federal Bureau of Investigation 14 years ago. He recently resigned as special agent in charge of the FBI's Detroit office.

American Louisiana is an affiliate of Michigan Consolidated Gas Company.

•

Three **Interstate Oil Pipe Line Company** employes, each of whom has completed more than 40 years of service with the company without a lost time industrial injury, recently were accorded special recognition. Honored were **J. B. Barnett,** district superintendent of Interstate's Lake St. John, La., district; **R. L. Holman,** station chief engineer of Weller Station, near Homer, La., and **E. E. Wasson,** station chief engineer of Finney Station, near Shreveport.

Individual certificates of honor from the Joseph A. Holmes Safety Association, national organization dedicated to promotion of safety in the mining and mineral industries, were presented to the men by Paul Witt, representative of the United States Bureau of Mines.

•

Nelson A. Chambers, machine shop foreman at the Ottawa, Kansas, compressor station of the **Cities Service Gas Company,** has retired after 45 years with the company. He started with Cities Service in 1910 as a pipe line worker at Weston, Mo., later transferring to the Scipio, Kansas, station as engine oiler.

In 1911 he helped load the station on a freight train to ship it to Hogshooter, Okla., an early camp in Washington County where he worked as blacksmith, repairman and machinist. He became machine shop foreman in 1942.

Question to management...

What is the real worth of Cathodic Protection?

The real worth of cathodic protection depends primarily upon its effectiveness after it is installed. Inadequately designed or improperly installed systems will not do the job. Savings on your corrosion control costs can best be obtained with experienced E. R. P. corrosion engineers working with your staff.

Successful cathodic protection requires careful investigation and correct interpretation of all factors affecting the corrosion of any buried or submerged structure. When you use Electro Rust-Proofing cathodic protection services, you are assured of a successful installation, for E. R. P. brings to each job a background of 20 years experience in survey, design and installation of cathodic protection systems.

Your inquiry—written now—will bring our engineers to discuss your corrosion control program—without obligation.

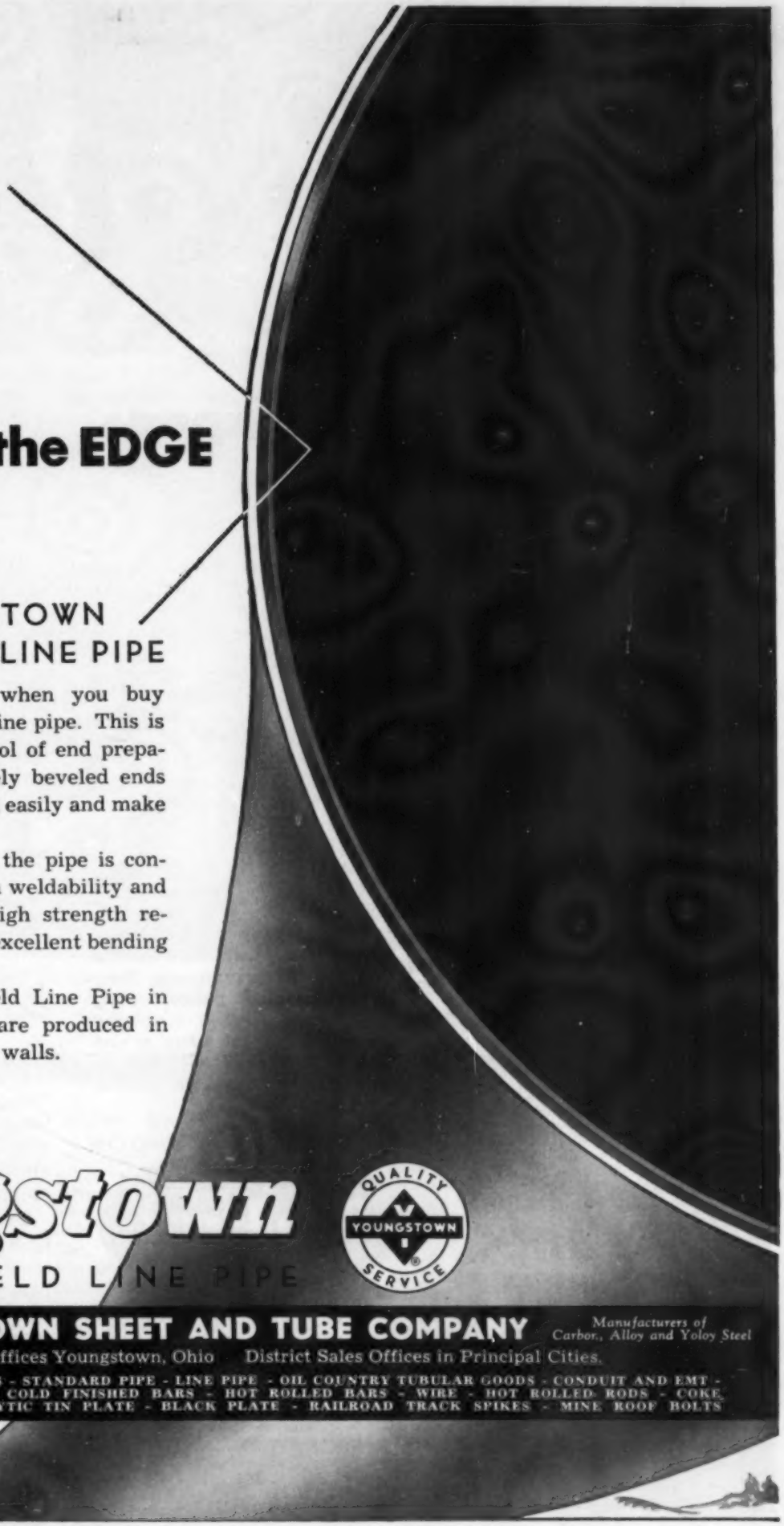
ERP CATHODIC PROTECTION

ELECTRO RUST-PROOFING CORPORATION

30 MAIN STREET, BELLEVILLE 9, N. J.

ATLANTA CHICAGO DALLAS MONROVIA SEATTLE

E-31



giving you the EDGE

ON YOUNGSTOWN ELECTRIC WELD LINE PIPE

You "Get the Edge" when you buy Youngstown high strength line pipe. This is provided thru careful control of end preparation to give you accurately beveled ends that will line up quickly and easily and make a satisfactory joint.

Chemical composition of the pipe is controlled to provide maximum weldability and ductility consistant with high strength requirements. This gives you excellent bending characteristics.

Youngstown Electric Weld Line Pipe in sizes 6" to 22" inclusive are produced in long lengths, with uniform walls.

Youngstown

ELECTRIC WELD LINE PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

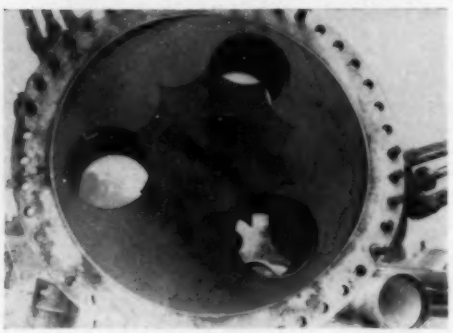
SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

Chief Draftsmen Attend Conference

The Southern Gas Association's Transmission Section Committee sponsored a Round-Table Conference for chief draftsmen recently in Houston. D. W. Bright (standing, center) of the Lone Star Gas Company sponsored the round-table, with 26 delegates from 20 S.G.A. member companies attending.

TOPAZ cut nine coupons for this "hot" tap!

Tapping machine set up for cutting operation.



Star shaped center coupon, left after nine overlapping 12" cuts were made.

Engineers of TOPAZ and T. D. Williamson, Inc., working with Phillips Chemical Company, had the problem of tapping into Houston's industrial water supply line, (60 psi) without taking the line out of service.

The tap, needed for connecting a branch line, necessitated making a larger hole than any tapping machine could cut in one operation. It was decided to cut nine overlapping 12" coupons, making a 43" hole with a scalloped circumference.

A Model 1200 Williamson-Hillco tapping machine was used for the cutting operation. To reduce time and labor costs, three 12" gate valves were mounted on the adapter flange, allowing three cuts to be made before rotating the flange. Successful completion of this assignment serves as one example of the many ways in which TOPAZ serves the pipeline industry.

Agents for:
T. D. WILLIAMSON, INC.
THE HOLCOMBE CO., INC.
L & M MARKERS & VENTS

Tod Pazdral
PIPELINE SPECIALTIES

TOPAZ

2525 SOUTH BLVD. • Houston, Texas • Office Phone JA 2-1403

Tod Pazdral • Consulting & Supervision • Home Phone MA 3-5680

F. A. (Jim) Ford	Jack Pelkey	Richard Lee McHenry
Consulting & Supervision	Sales & Service	Sales & Service
Houston	Atlanta	Dallas

GROVE SEAL "O" RING VALVES • TIPTON WELDING CLAMPS • WACHS SAWS • ALSTON PIPE CUTTING MACHINES • FLEETLINE PIPE SADDLES & REDUCERS • H & M CUTTING & BEVELING MACHINES • ANDERSON EQUIPMENT CO. HEAVY MACHINES • ORDER FROM TOD PAZDRAL

Louis E. Floyd, manager of the Haughton, La., compressor station of **Texas Gas Transmission Corporation** since 1952, has been appointed manager of the company's new 4500-horsepower Columbia, La., station now under construction. Succeeding him at the Haughton station will be **Joe Russell,** former assistant manager at Sharon.

Floyd joined a predecessor company of Texas Gas in 1945, at Wilmot, Ark. He later served as maintenance foreman at Wilmot and at Bastrop, La., before being named assistant manager at Sharon. Russell has been employed by Texas Gas and a predecessor company since 1944. He was assigned to the Benoit, Miss., station until his appointment as station maintenance foreman at Sharon in 1952. He was named assistant manager at Sharon in 1953.

Three employes of the Shreveport Gas Supply department of Texas Gas recently promoted to supervisory positions are **Louis S. Arrington,** senior geologist, named supervisor of geologists; **Alfred E. Little,** senior gas supply engineer, promoted to supervisor of proration; and **Robert D. Northcutt,** senior gas supply engineer, appointed supervisor of reservoir engineering.

Ralph W. Thacker, manager of the Employe Relations department of Texas Gas, was appointed assistant to the secretary August 1. Joining the company in 1949 as manager of general office services and the reproduction department, Thacker took over the duties of manager of employe relations in 1950.

•

Appointment of **Frank N. Seitz** as vice president of **Southern Counties Gas Company of California** has been announced. Formerly general sales manager, he now will be in full charge of the utility's sales programs.

Seitz succeeds Vice President **Frank B. Wright** who is responsible for coordination of activities of the company's eight operating divisions, in addition to his direction of customers', customer service, public relations, news and publications and advertising departments.

Seitz joined Southern Counties as sales manager in 1950 from its affiliate, Southern California Gas Company. He has been in the natural gas business in California since 1939.

Just 3 cc. of Santolene C per 55-gallon drum STOPS PIPELINE RUST!

One treatment does the trick! Santolene C protects metal surfaces from refinery to consumer, cuts maintenance and overhaul costs caused by rust, saves up to $70,000 a year on steel replacement in a single tanker! Soluble in oil and compatible with other additives, burns with fuel. Available in tank cars and 55-gallon drums.

NEW SANTOLENE C BOOKLET FREE!

Gives valuable product-in-use information covering applications in pipelines, oil tankers, aviation and distillate fuels, motor-grade and antifreeze gasoline . . . shows service tests which prove Santolene C's long storage life, compatibility with other additives, nontoxicity, etc. Twenty pages of practical, useful information. Write for free booklet to Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478-R-7, St. Louis 1, Missouri.

Santolene: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . .
WHICH SERVES MANKIND

This OPENING and CLOSING motion....

LUBRICATES
your plug valves
AUTOMATICALLY
when you equip with....

DELTA
AUTOMATIC
PLUG VALVE
LUBRICATOR

Engineers agree that plug valves should be lubricated each time they are opened and closed.

NOW they can be—automatically—by the adaption of this simple, fool-proof device, that never forgets.

Each time the valve is opened and closed a measured amount of lubricant is forced in. The reservoir holds enough lubricant for the valve to be opened 50 to 80 times, and is refilled in seconds with the Delta Gun.

The savings in time, trouble and valves will repay the small cost of this Delta Lubricator again and again. Write for details and prices.

The Only Complete Plug Valve Lubrication Company

DELTA ENGINEERING SALES CO.
804 Louisiana Ave. Shreveport, La.
Sales Offices in All Principal Cities

DELTA-DESCO
PLUG VALVE
LUBRICANTS
AND EQUIPMENT

LUBRICANTS FITTINGS GUNS LUBRICATORS

What's Happening

AMONG SERVICE AND SUPPLY MEN

C. W. Lee

Alden G. Roach

US Steel Promotes C. W. Lee To Head Consolidated Western

United States Steel Corporation recently announced the appointment of Charles W. Lee as president of Consolidated Western Steel division.

Lee, who was previously vice president and general manager of Consolidated Western, succeeds Alden G. Roach, now president of Columbia-Geneva Steel division, the primary steel producing division of US Steel in 11 Western states.

As a part of functional changes accompanying the organizational change, the Orange, Texas, plant of Consolidated Western will be transferred to American Bridge division, which will also assume responsibility for bridge and structural fabrication and erection in the Western area previously served by Consolidated Western. These changes will permit Consolidated Western to put greater emphasis upon manufacture of various types of products now produced at its Maywood plant.

The National Tube division will handle sale of expanded line pipe produced at the Orange plant. Consolidated Western will continue to handle sale of pipe produced at the new Utah plant.

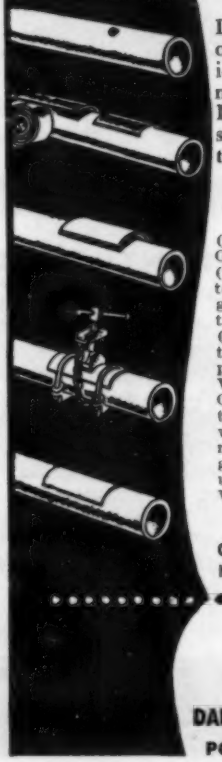
Lee has been with Consolidated Western since its organization in 1929. For five years prior to that time, he was associated with the Llewellyn Iron Works, a predecessor of Consolidated Western. Roach, with Consolidated Western and its predecessor since 1929, was made president of the division in 1941. He became president of Columbia-Geneva in 1948.

Johnston Executive to Handle Johnston and Emsco Advertising

William J. Alexander, advertising manager of Johnston Pump Company of Pasadena, Calif., also has been appointed advertising manager of Emsco Manufacturing Company and will coordinate and direct advertising of both organizations. To consolidate the two advertising programs, Emsco will concentrate all of its advertising activities in California.

NOW! Fits Up to 30" CASINGS

TO STOP PIPE-LINE LEAKS
Simply-Quickly



DALLAS GRO-CORD GASKETS now offer the complete pipe-line gasket service. Formerly up to 10", GRO-CORD'S new stock is now made UP TO 30 INCHES in two sections—flat and crown stock plied together to insure safe, extra-tight sealing.

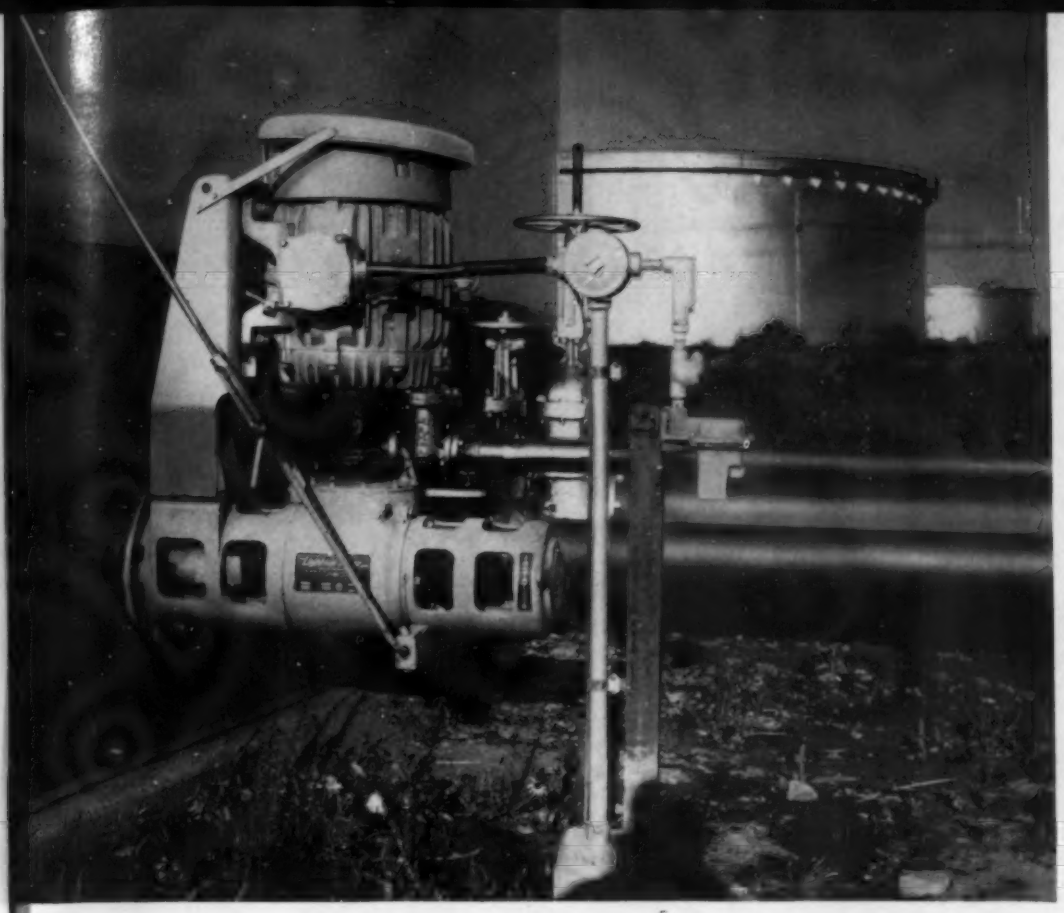
Easy to Apply . . .
They Last for Years

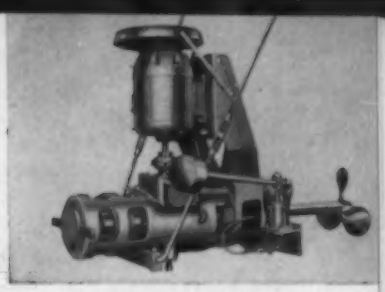
(a) Regardless of size of leak, just cut GRO-CORD gasket to cover generously . . . (b) Cut a piece of plate (half sole or sleeve) to extend about 1" on both sides and ends of gasket . . . (c) Fit plate over gasket so as to extend beyond gasket on all sides . . . (d) Clamp repair tight with a chain jack to shut off the leak . . . With clamps, hold plate in contact with pipes at all points. Weld all around and REMOVE CLAMPS. GRO-CORD gaskets have been in service up to 5 years before permanent or final weld was made. Tested at 1600 lbs. p.s.i., oil resistant, cotton impregnated GRO-CORD gaskets last for years. 15 years exclusive use by major gas distributing company. Write for literature.

Distributed By:
Oilwell Supply Division of United States Steel Corp.
Iverson Tool Company • Norvall-Wilder Supply Co.

Jobber Inquiries Invited. Write for Folder PE-11

DALLAS
GRO-CORD
PIPE REPAIR GASKETS
DALLAS MANUFACTURING & SALES COMPANY
POST OFFICE BOX 7181 DALLAS 9, TEXAS





YOU CAN GET LIGHTNIN Side Entering Mixers for tanks of all capacities. Sizes 1 to 25 HP.

LOWER UPKEEP COST. This cartridge seal (optional) takes the place of a mixer stuffing box, runs without attention, comes out in one piece for easy, rapid replacement.

Mixer for BS&W saves $1,000 per year

Keep crude oil tanks clean by flipping a switch . . . for less than it costs to do it the hard way

What happens to operating costs when you use mechanical mixers to keep sediment cleaned out of your crude oil tanks?

For one large pipe line company handling Texas and Oklahoma crudes, it means a direct, traceable saving of $1,000 per tank per year.

And this saving tells only part of the story.

In careful field tests, this company has proved it pays in more ways than one to clean tanks by flipping a mixer switch.

Tanks work harder

For one thing, every tank can work at full capacity—whenever needed. Normal dispatching isn't disrupted by tanks being "down" for cleaning.

Sediment doesn't build up, so there's none of the usual slow decline in tank volumetric efficiency that comes with sludge accumulation. Then, too, corrosive products in sediment don't get much chance to go to work on the tank bottom.

Hand gauging is much easier with no settled sludge in the tank. Finally, loss of refinable oil and wax, which normally accumulate at the tank bottom, is eliminated.

Getting the right mixer

What can *you* save? A lot depends on getting mixers that will run year in, year out, with minimum upkeep, no mechanical troubles.

That's why so many pipe line stations are specifying LIGHTNIN Mixers for crude oil sediment control. LIGHTNINS are built so they can't get out of alignment—ever. You can repack a LIGHTNIN stuffing box from outside a full tank, without losing a pint of product. The shutoff device is out in the open—easy to get at.

And if you really want to shoot holes in maintenance cost, specify LIGHTNINS with the new, *quickly-replaceable* rotary mechanical seal. With this seal, you eliminate stuffing-box maintenance forever. The seal positively stops leakage, runs for years without attention, yet is easily replaced in a few minutes if it should ever wear out. You can replace it without draining the tank; without dismantling or demounting the mixer; and *without special skill.*

For the whole cost-saving story, call in your LIGHTNIN Mixer representative, or write us today.

Get these helpful facts on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with name and company address. Free—no obligation.

- ☐ B-503 illustrated bulletin on BS&W control
- ☐ B-104 20-page catalog fully describing LIGHTNIN Side Entering Mixers
- ☐ B-107 Mixing Data Sheet
- ☐ B-110 Condensed Catalog describing LIGHTNIN Mixers of all types
- ☐ B-111 Bulletin describing LIGHTNIN rotary mechanical seals for extra-low-cost mixing

MIXING EQUIPMENT Co., Inc., 196-j Mt. Read Blvd., Rochester 11, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.

Lightnin® Mixers™

MIXCO fluid mixing specialists

Union Oil Company to Install RCA Microwave Radio System

A multi-service microwave radio relay system, providing voice communication, VHF control, and telemetering circuits, will be installed for the Union Oil Company by the Engineering Products division, Radio Corporation of America. The system will extend from the utility's Mulholland control center in Los Angeles to a pumping station at Torrey, Calif., and on to a Santa Paula, Calif., branch office.

The installation will utilize standard RCA microwave equipment which makes possible additional microwave stations in already crowded geographic areas. In addition to being designed for operation in the relatively unused 2450-to-2700 megacycle band, the MM-26A equipment has approximately one-half the spectrum requirements of most other systems, a feature which permits even greater concentration of stations in a given region.

Page Advanced by GE To Engineering Specialist

The appointment of Charles P. Page as manufacturing engineering specialist for the Distribution Assemblies department of the General Electric Company recently was announced. He will be responsible for formulating and recommending new and revised manufacturing methods and processes involving development of plant layout and material handling methods, and the recommendation of sources of supply for tools, dies and other facilities.

Page joined General Electric in 1953. Previous to his present appointment, he was manufacturing project engineer in the Trumbull Components department.

Everything for the Pipeliner
PERRAULT AMERICAN
TAR-HEATING KETTLES
Power-Agitated, Absolutely Non-Coking
Ten and twenty-five barrel capacities. Twenty-five barrel kettle is completely insulated. Power agitation is mechanical, absolutely prevents coking under continuous service. Powered by Wisconsin air-cooled engine. Mounted on Athey tracks or steel skids. Safety type extracting valve, low center of gravity. Ten-barrel kettle mounted on steel wheels with 12" tread. These kettles will give less trouble, greater efficiency in your operation. To see one call Perrault Equipment Company.
ALSO: Cleaning and Priming Machines and Coating and Wrapping Machines in both line traveling and stationary types. Patch Pots, Burners, and Accessories. Glass Pipe Wrap, Asbestos Felt Pipe Wrap, and Kraft Wrap. Rock Shield.
AND: Pneumatic-Tired Lowering-In Cradles, Adjustable Pipe Cradles, Five-Roller Cradles, Tongs, Sling Belts, and Hooks, Line-Up Clamps. Hand Tools. Supplies and Equipment of every sort.
Sole Owner, W. O. DIXON
PERRAULT Equipment COMPANY
TELEPHONE 5-1103 • 1130 NORTH BOSTON • TULSA 6, OKLAHOMA
EXPORT OFFICE: SUITE 1655, 45 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

R. M. Reiner

W. Niederstrasser

New Manufacturing Plant Opened By Canadian Western Pipe Mills

More than 800 business, industrial and government leaders and guests from Western Europe, the U. S. and Canada toured the new multi-million dollar pipe, tube and conduit manufacturing center of Canadian Western Pipe Mills Ltd., formally opened July 20 by Premier W. A. C. Bennett. Located in one of the West Coast's fastest growing secondary industrial regions, the plant is estimated to represent a capital investment of well over $6 million.

F. J. Allan

Canadian Western's R. M. Reiner, vice president and managing director, heads the new plant; production chief is Wilfred Niederstrasser who headed similar plant of Canadian Western's parent company, the Rheinrohr Organization in West Germany. F. J. Allan, who has extensive background in steel product sales throughout Canada, has been named sales manager.

Representing the parent company at the opening were Polenz, Dr. Heinrich Hofmeier, Dr. Karl Bender and Wilhelm Schmidt, all directors of Rheinrohr, who made special trips to Canada for the opening.

Walworth Company Purchases Valve and Fittings Company

As a major step in a diversification and expansion program, the Walworth Company has concluded arrangements for purchase of the assets and business of the M & H Valve and Fittings Company of Anniston, Ala.

M & H, manufacturer and distributor of valves and hydrants for water companies, filtration and sewer disposal systems, fire protection systems and industrial plants will operate as a division of Walworth. All management and employes will be retained, with policies and operations continuing the same.

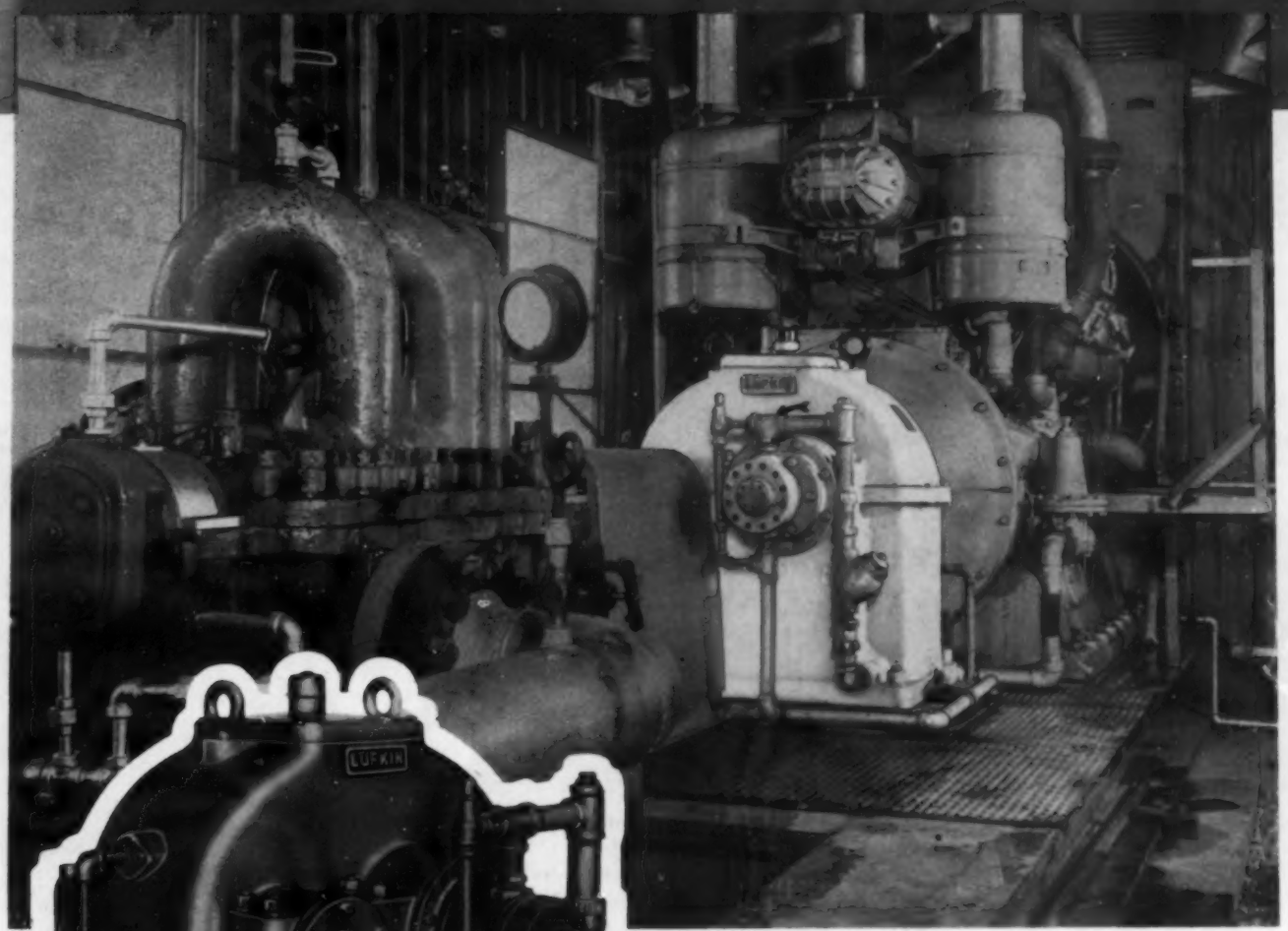
The purchase adds modern foundry and machine shop facilities covering 200,000 square feet and a 17-acre plant site to Walworth's regional manufacturing plants.

W. B. Lawrence Named Manager Of A-C's New Columbus District

Establishment of a new sales district under the management of Walter B. Lawrence with headquarters in the Kingswood building, Columbus, Ohio, has been announced. Lawrence joined Allis-Chalmers in 1934 and has been a sales representative in the Cincinnati district office since 1943.

LUFKIN Precision Gears

GUARANTEE THE UNINTERRUPTED TRANSMISSION OF POWER SO NECESSARY FOR THE UNINTERRUPTED TRANSMISSION OF OIL



HERRINGBONE GEARS GENERATED WITH EXTREME ACCURACY—RIGIDLY MOUNTED IN HEAVILY REINFORCED HOUSING—TO GIVE MANY YEARS OF QUIET, VIBRATIONLESS, TROUBLE-FREE OPERATION.

LUFKIN OFFERS A COMPLETE LINE OF SPEED INCREASERS FOR ALL TYPES OF PIPELINE SERVICE.

Lufkin **FOUNDRY & MACHINE COMPANY**

LUFKIN, TEXAS

Branch Sales and Service: Houston • Dallas • New York • Tulsa • Los Angeles • Seminole • Oklahoma City • Corpus Christi • Odessa
Kilgore • Wichita Falls • Casper, Wyoming • Great Bend, Kansas • Effingham, Illinois • Duncan, Oklahoma
Brookhaven, Mississippi • El Dorado, Arkansas

Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, EDMONTON, ALBERTA, CANADA

Pazdral Is Southern Agent For New Wachs Pipe Saws

Tod Pazdral Pipeline Specialties, Houston, is now exclusive agent for Wachs national pipe saw and Wachs guillotine pipe saw in Louisiana, Mississippi, Alabama, Georgia, Florida, North and South Carolina.

The new Wachs national saw is a portable machine designed to cut steel or cast iron pipe from 10 inches to 48 inches at a cutting speed of 2½ inches per minute. The 300-pound machine can be handled by two men and easily operated by regular street crews. It requires only 16-inch clearance around the pipe to make a cut in a ditch, and special sealed construction allows cuts to be made under water.

The guillotine saw is a new portable machine for cutting cast iron and steel pipe of two inches to eight inches. Weighing only 105 pounds, it can be set up and handled by one man.

Joyner to Be Manager, Sales Of Quaker Pioneer Rubber Mills

James H. Joyner, recently named manager, Pacific Coast Sales, Quaker Pioneer Rubber Mills, division of H. K. Porter Company, Inc., had been manager of the Los Angeles branch since Quaker Pioneer's acquisition by H. K. Porter in 1954. Prior to that he had been salesman and manager of the St. Louis branch of Quaker Rubber Corporation. His new duties will include supervision of Quaker Pioneer's sales personnel and activities in ten Western states.

Smith Heads Sales Organization Of Napko Paint Company

Sidney V. Smith, industrial sales manager of Napko Paint Company, has been appointed to the newly-created position of general sales manager. He will coordinate and direct sales efforts of both the Architectural and Industrial Sales divisions, working with respective division heads. Previously each division operated under separate management.

Sidney V. Smith

Smith joined Napko in 1951 as industrial sales engineer, advancing to industrial sales manager in 1952. He previously had been with Plastic Coating Corporation.

Cleveland Trencher Announces Three Executive Appointments

The Cleveland Trencher Company has announced the promotion of E. B. Volmar to vice president in charge of manufacturing and the appointment of Clifford P. Morgan as sales manager and David L. Raymond as chief engineer.

Works manager for the past five years and an employe of the company more than 15 years, Volmar also has been elected to the board of directors. Morgan steps into the post previously filled by John A. Penote, now vice president in charge of sales. Raymond succeeds Albert R. Askue who retired recently after serving as chief engineer 15 years.

McMurry Heads Crane Activities As New Director of Branches

Jess A. McMurry, named director of branches for Crane Co., will have full responsibility for the operation of all activities of Crane's field organization.

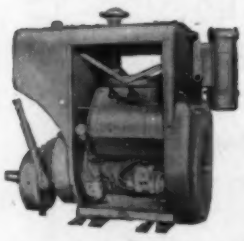
McMurry joined Crane in 1917 at the Atlanta branch, and was appointed manager of the New Orleans branch in 1940. He has been district manager in Dallas since 1945.

R. G. Hunter, manager of the Tulsa, branch of Crane Co. since 1946, will replace McMurry at Dallas. Hunter has been with Crane since 1925 when he joined the company at the Springfield, Ill., branch.

WISCONSIN-POWERED

Variable Controlled Pumping Unit

This highly-mobile trailer-mounted pumping unit is powered by a VG4D Power Unit with a heavy-duty transmission having several speed ratios, reverse and neutral. The engine couples directly to a 2" rotary pump with a capacity of 14 BPH @ 1,000 lbs. and 70 BPH @ 400 lbs. While the picture above shows the unit testing a pipe line in Southern Oklahoma, it's also widely used to pump crude oil of various viscosities into pipe lines having a wide range of pressures. Does the unit deliver dependability? See what the operator says about its record.



Model VG4D Power Unit (25 to 36 hp.) with Clutch Reduction.

"The performance is trouble-free," he states. He also adds that this lightweight unit, "really gets the job done — no matter what the assignment." . . . a typical opinion from a satisfied user.

Wisconsin Heavy-Duty Air-Cooled Engines are available in a complete power range from 3 to 36 hp., in 4-cycle single cylinder, 2- and V-type 4-cylinder models. These engines can be equipped to operate on kerosene, butane, propane or casinghead gas, utilizing the most readily available and economical fuels.

You can't do better than specify "WISCONSIN ENGINES" for your equipment.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

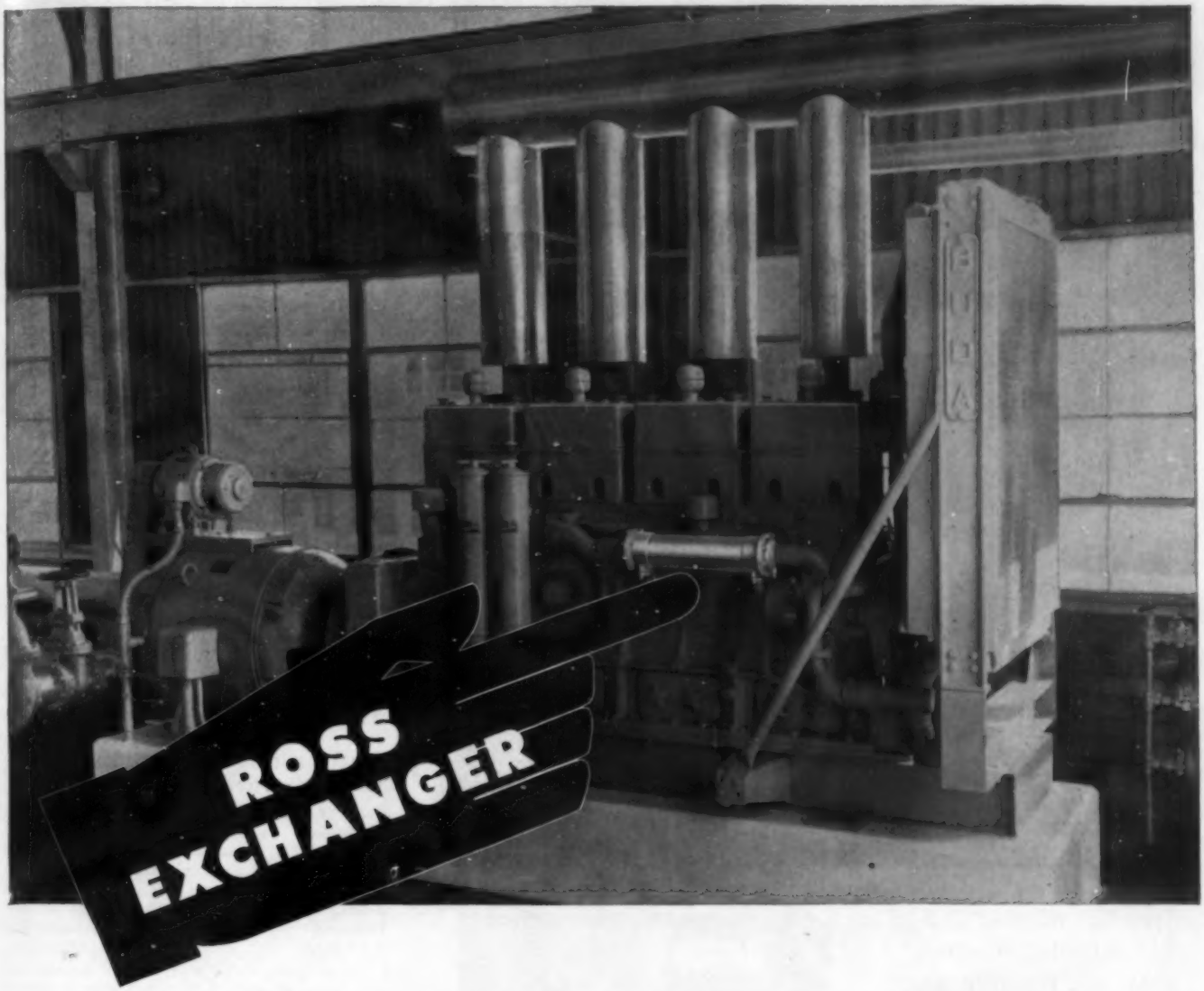
WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
3420 McKINNEY AVENUE • HOUSTON, TEXAS
205 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

A 8386-½I

PIPE LINE INDUSTRY
"I have a problem . . ."

Assuring uniform temperature and a continuous flow of lube oil

in this Buda engine



Serving one of the nation's largest gas transmission companies, this Buda 8-PC-2505 Natural Gas Engine is rated 356 hp at 1200 rpm.

To cool oil at high loads and heat oil at light loads, a Ross Type BCF Exchanger has been furnished here. Both uniform lubrication temperature and a continuous flow of oil through the filters are assured.

Because of their outstanding record for ruggedness and high thermal efficiency, Ross Type BCF Exchangers are regularly selected for leading make Diesel, gas and gasoline engines to cool lube oil and/or jacket water.

Of enduring all copper and copper alloy construction, they are completely pre-engineered and stocked in a wide range of fully standardized sizes to meet your needs . . . promptly.

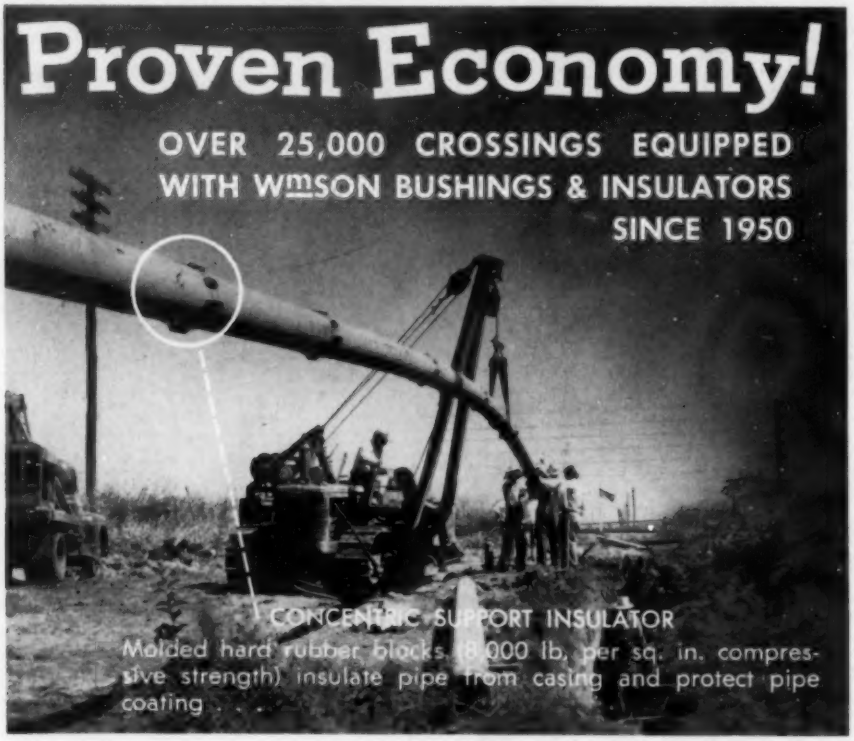
For detailed information, request Bulletin 1.1K5.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1450 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

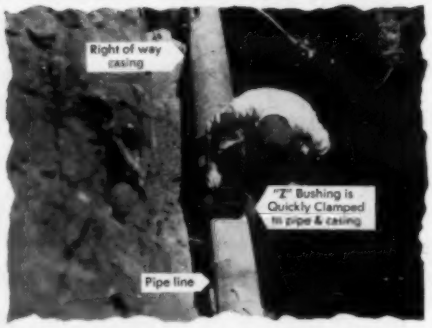
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

View New Mobil Power Plant

Watching a demonstration of the new Clark turbomobile power plant are (left to right) H. N. Mallon, president of Dresser Industries, Inc.; Capt. J. C. Tily, District Public Works Office, Third Naval District; John H. Standbaugh, White House assistant; Comdr. F. B. Kelly, District Public Works Office; J. B. O'Connor, executive vice president of Dresser Industries; and J. N. Mackendrick, president of Clark Bros. Co., one of the Dresser Industries. This new 5500 KW gas turbine power plant built by Clark for the U. S. Navy is mounted on a specially designed railroad car and can be moved quickly to areas requiring emergency power.


Proven Economy!
OVER 25,000 CROSSINGS EQUIPPED
WITH WmSON BUSHINGS & INSULATORS
SINCE 1950
CONCENTRIC SUPPORT INSULATOR
Molded hard rubber blocks (8,000 lb. per sq. in. compressive strength) insulate pipe from casing and protect pipe coating . . .

Type "Z" WmSEAL CASING BUSHING. POSITIVE SEAL . . . POSITIVE INSULATION. Heavy sleeve of tough synthetic rubber withstands abuse and weight of backfill earth. INSTALLED QUICKLY . . . No Shield Required.



LOW COST plus **ENGINEERED DESIGN** give **LASTING ECONOMY** for your Highway and Railroad Crossing Jobs . . .

Write for literature

T. D. Williamson, Inc.

P. O. BOX 4038 TULSA 9, OKLAHOMA

REPRESENTATIVES

Houston • Pittsburgh • Kenilworth, N. J. • Amarillo • Casper • Provo, Utah • Joliet, Illinois
Los Angeles • San Francisco • Bartlesville, Okla. • Edmonton • London, Ontario • Calgary
Buenos Aires • Durban, Natal, South Africa

Stewart & Stevenson Transfers Two to Sales Department Posts

Stewart & Stevenson Services, Inc., has announced two new appointments to the Sales department in Houston: M. L. (Mike) Ferguson has been transferred from direct field service to sales where he will act as liaison man between Field Service and Sales and Engineering departments; Bill Powell has been transferred to sales where he will concentrate on petroleum industry engine sales in Houston and the surrounding area.

Ferguson has been employed by Stewart & Stevenson since 1945, starting as a mechanic in the Service department. Powell began with the company in 1946 in the Repair and Service and Parts and Service Sales departments.

Cal Metal Pipe Corporation Opens Houston Sales Office

A. H. Davis has been named sales engineer of the new sales office Cal Metal Pipe Corporation of Louisiana recently opened in Houston. The office is located at 4101 San Jacinto.

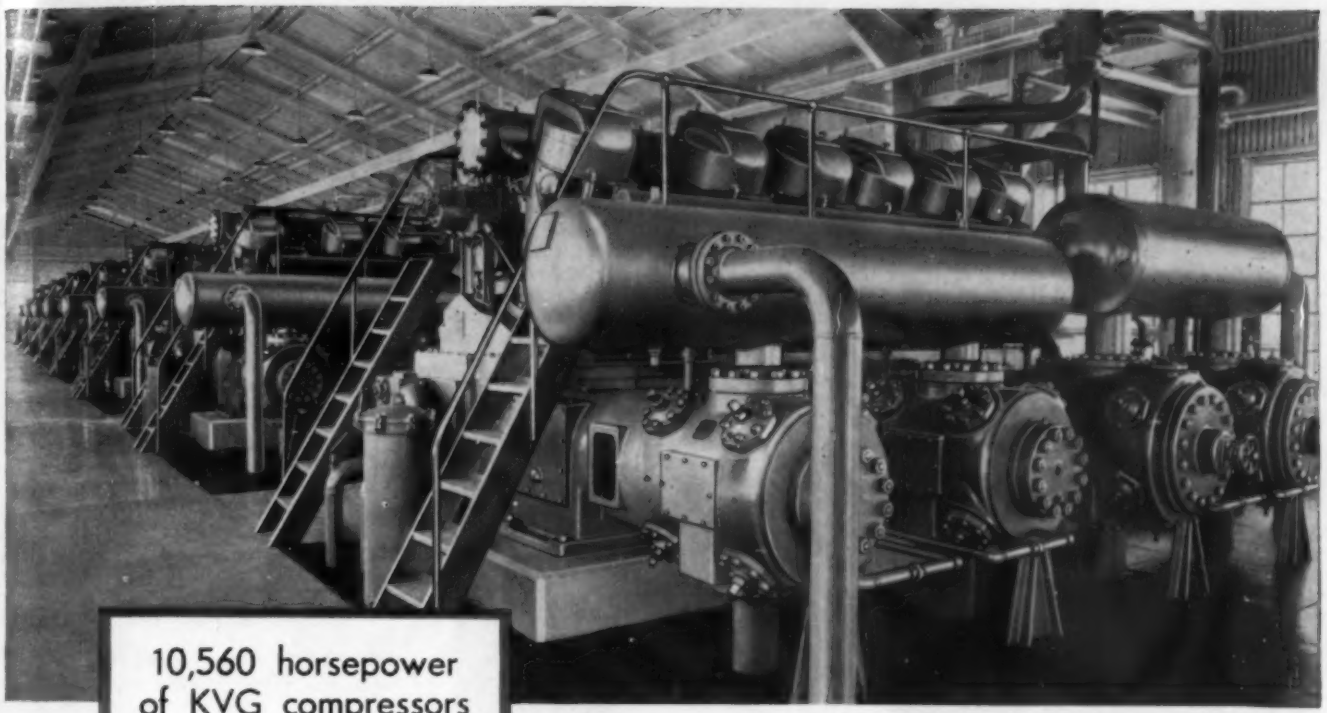
Montana, New Mexico Firms To Handle Nordberg Engines

Appointment of Tractor & Equipment Company, Sidney, Mont., as distributor and service headquarters for Nordberg POWER CHIEF diesel and gas engines in the eastern third of Montana and the western quarter of North Dakota is announced by Nordberg Manufacturing Company.

With main sales and service headquarters located at 201 North Central Street in Sidney, Tractor & Equipment Company also has branch stores in Glasgow and Miles City, Mont. J. H. Harnish is president and general manager of the organization; R. A. Kaneski and J. C. Timmons manage the Glasgow and Miles City stores. A fully equipped service department that can handle both field and shop work is part of the facilities of the Sidney operation.

In New Mexico and Texas, Nordberg has appointed Lively Equipment Company of Albuquerque and their affiliate Lively Equipment Company, El Paso, as distributors for POWER CHIEF diesel engines in New Mexico, the El Paso area and northeastern Arizona.

The El Paso store is operated by Robert Mackey, who is also a vice president of the company. D. Orton Smith serves as secretary-treasurer. In January of this year Lively Equipment expanded operations to include an engine division which is managed by Ralph Roller. Roller has ten years experience in the engine field.



10,560 horsepower of KVG compressors at Permian Basin Pipeline Company

These eight Ingersoll-Rand KVG gas-engine compressors provide a total of 10,560 horsepower for a gas compression station of the Permian Basin Pipeline Co., a subsidiary of Northern Natural Gas Company. Each machine consists of a 12-cylinder, V-type, four-cycle gas engine with four compressor cylinders mounted on the same frame and driven from a common shaft.

On any service I-R Gas-Engine Compressors offer two basic advantages

Wide load fluctuations are unavoidable in many compressor applications. That's why the *flexibility* of I-R FOUR CYCLE gas-engine compressors is a big asset. They always deliver smooth, steady power all the way from no load to full load and at any speed from half to full rated rpm.

The second basic advantage is in the *compressor end.* Here the extra dependability and the trouble-free performance of I-R job-engineered cylinders and valves add up to exceptionally low maintenance expense. This has been proven repeatedly in hundreds of installations covering all types of air and gas compression requirements.

Ingersoll-Rand four-cycle gas-engine compressors are available in sizes from 110 to 2000 horsepower. Call in your I-R representative when planning your next installation. His experience can save you time, effort and expense all along the line.

Ingersoll-Rand

6-267 11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

Jones & Laughlin Sales Offices Opened in Regina, New Orleans

The recent addition of a new sales office to Jones & Laughlin Steel Corporation's Canadian Operations by its Canadian subsidiary has been announced. The newly-organized sales office, under the name of Jones & Laughlin Steel Sales Company, Ltd.—Supply Division, has been established in the Metropolitan building in Regina, Saskatchewan.

H. Carl King, who has served as resident sales representative in Regina for the past year, will maintain headquarters at the new office and will continue to serve in the provinces of Saskatchewan and southeastern Manitoba.

In New Orleans, Jones & Laughlin Supply division has established a new district sales office in the Hibernia Bank building. Clarence E. Rogers, Louisiana Gulf Coast district sales manager, will maintain office headquarters in the new office with Bill Wood, salesman for the New Orleans area.

F. J. Geiger Named Manager Of A-C Norwood Works

Appointment of F. J. Geiger as general manager of the Allis-Chalmers Norwood, Ohio, Works has been announced. Formerly manager of sales and engineering, Electrical section, he succeeds P. F. Bauer, recently named general manager of the company's Industrial Equipment division.

Geiger has been with Allis-Chalmers more than 35 years. He served in the New York office before being transferred in 1938 to the Norwood Works as assistant manager of sales of the Electrical department.

ARCCO
ARCCO CANNON NEVER-DRY PEN
Writes for Months
REPLACES OTHER MAKES • USES REGULAR INKS
Regardless of pulsations or other causes of ink failures this new Never-Dry Pen will make clean and complete records. Ink supply lasts for several months without refilling reservoir. Capillary tube from ink bottle placed in instrument case feeds pen with continuous flow. Closed system sealed from atmosphere prevents clogging and dirt accumulation.
Weight of pen is constant at all times thus insuring extreme accuracy. No slopping or dripping. Stainless steel construction—no corrosion. When ordering, specify make and type of recording instrument.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
$6.00 each Net
Send for quantity prices
SEND FOR BULLETIN NO. 115

C. M. Reagle

James W. Reed

Cooper-Bessemer Announces New York, Pacific Coast Changes

The assignment of C. M. Reagle as district manager of Cooper-Bessemer's New York domestic territory has been announced. Presently a vice president and director of Cooper-Bessemer, Reagle is also manager of marine sales. He will be responsible for sales of diesel engines, gas engines and gas-diesel engines in the power generating field and the marine industry.

Reagle joined the original Bessemer Gas Engine Company in 1922 and became a vice president and director in 1925. He was elected a vice president in 1929 when Bessemer merged with The Cooper Company to form the present corporation.

James W. Reed, vice president of Cooper-Bessemer, has been appointed Pacific Coast manager, in charge of the company's offices located in Los Angeles, San Francisco and Seattle. John Rogers who held the position 15 years, has been appointed special representative and consultant.

Reed, a vice president since 1947, has been New York district manager of compressor and stationary engine sales since 1940. He joined the company in 1922. Rogers joined Cooper-Bessemer in 1940 after 25 years of experience in the compressor and power engine field.

Bristol Company Makes Nuber General Field Sales Manager

Ernest Nuber, promoted to general field sales manager for The Bristol Company joined the company's sales engineering organization in 1929. In 1948 he was named manager of the Application Engineering department and has held the position of sales manager since 1954. Before joining Bristol, Nuber was with New York Edison Company in the General Test and Engineering department and later with Western Electric Company and the Board of Transportation of New York City.

Ernest Nuber

Veteran Employe Appointed Walworth Chief Engineer

The appointment of Newton Ewalt as chief engineer of the Walworth Company has been announced. He has been employed by the company since 1926, serving in various capacities in engineering, production and sales. Prior to his latest appointment, Ewalt was department manager of power plant sales.

Water treatment gives you better pipe!

To give you quality line pipe that meets your exact specifications, every length of Basalt-Kaiser steel pipe 20 inches and over is expanded by water under great pressure.

Hydraulic expansion increases the strength of Basalt-Kaiser steel line pipe through additional cold working. This takes place within restraining dies assuring accurate diameter, concentricity, and straightness.

Add to this our *on-time delivery, wide range of sizes* and *prompt personal service* and it's clear why pipeline men know they can rely on Kaiser Steel.

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, California
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, California
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, California
Electric Resistance Weld—Plain End	14" to 20" O.D.	Up to 40'	.250" to .500"	Napa, California
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, California

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Phoenix, Denver, Tulsa, New York

A finish welder at work on a joint of 10¾" O.D. National Seamless Bend

ENTIRE SOUTHEAST ALABAMA GAS DISTRICT S

22,000 tons of NATIONAL S

Coated and wrapped pipe being laid in preparation for back filling Weld

Bending and welding 10¾" O.D. National Seamless for a creek crossing.

SERVED BY

SEAMLESS Line Pipe

Welders and wrappers at work on a portion of the 10¾" O.D. main line.

THE Southeast Alabama Gas District, consisting of 24 communities, will be served by a 330-mile "U" shaped system of USS National Seamless Line Pipe, designed by Goodwin Engineers, Inc., of Birmingham, Alabama.

The new main line ties into Southern Natural Gas Company's line approximately 12 miles south of Montgomery. It runs south to Brantley, then turns eastward at Andalusia and continues through Enterprise to Dothan. From Dothan it runs north and ties back into Southern Natural's line a few miles south of Opelika, Alabama.

The total 22,000 tons of pipe were made up of 6⅝" O.D., 8⅝" O.D. and 10¾" O.D. National Seamless. It was transported to the installation site in Alabama by both barge and rail from plants in Ohio and Pennsylvania.

USS National Seamless Pipe is chosen consistently for the most challenging of cross-country pipeline jobs. Engineers know from past successes, like the "Big Inch" and the Straits of Mackinac crossing, that the best line installations are accomplished with National Seamless. Its high strength, complete uniformity, and a flexibility that lets it absorb ground pressures and bending stresses keep it trouble-free, even under the most punishing conditions.

IN GAS LINES TOO . . . SEAMLESS DOES IT BETTER

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

National Seamless Pipe and Tubes

WELDS WITHOUT WELDS

UNITED STATES STEEL

What's New in Equipment

for the Pipe Line Industry

Hydrocrane

The new all-hydraulic H-5 hydrocrane, developed by Bucyrus-Erie Company, is extremely maneuverable and mobile and can be used for high lift, close quarter erection; heavy bucket or crane work; big lift, indoor jobs and precision materials handling assignments.

Completely new, it is available as a ½-cubic yard excavator and as a 9-ton lifting crane. Designed for mounting on conventional motor trucks, it can be made to conform with state highway restrictions regulating width, height and axle load limits.

Newest of the hydrocrane line, the H-5 has an 18,000-pound maximum lift. It can be equipped with standard two-piece boom (telescoping from 24 feet to 36 feet) or with an optional high-lift, three-piece boom (extendible from 38 feet to 50 feet). Comparatively short tail swing makes it adaptable for close-quarter work.

Other features include precision hydraulic control; four patented outriggers which provide more stability, greater leverage without counterweight and instant leveling; gooseneck construction at the boom point; welded steel boom; sturdy, alloy steel revolving frame; simple deck machinery; self-power unit and easy-to-operate fingertip controls. A remote control unit to operate truck from crane cab is optional equipment.

Safety features include an automatic internal lock to prevent outriggers from drifting down during travel; automatic relief valves for controlled stopping without bounce-back; a safety valve in the hoist circuit to prevent shock in abrupt stops and an indicator in the operator's cab to check load against weight limits on the capacity plate.

(This item supplements Bucyrus-Erie Company data on Pages 913-918 of the Composite Catalog, 20th Edition.)

For more data circle **No. E1** on Readers' Service Card, last page this issue.

Diaphragm Motor Valves

Fisher Governor Company announces new improved diaphragm motor valves which are available in direct acting or reverse acting construction.

The new units have a bolted-clamp type stem connection which allows stem adjustment of 50 percent of total travel in either direction. It will not shake loose from vibration or rotational inner valve forces, and it can be disconnected in the field without damage to the stem.

Diaphragm casings are of drawn steel. Specially designed Buna-N molded diaphragms with nylon insert retain superior flexibility at low ambient operating temperatures. It provides linearity of relationship between instrument signal and travel, and provides maximum effective area.

The yoke is hi-tensile iron. The yoke to body connection is accomplished with a rugged forged steel hammer lug nut. Topwork may be removed without disturbing the stuffing box, which is the bolted clamp type with teflon packing. The stainless steel travel indicator is calibrated in percent of valve travel.

(This item supplements Fisher Governor Company data on Pages 1606-1607 of the Composite Catalog, 20th Edition.)

For more data circle **No. E2** on Readers' Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.

PIPE...OR...PLATE

Only Westinghouse XL-610 The New (E-6010) Electrode can offer these advantages . . .

- Pinhole-free, x-ray quality welds in any position. Fewer rejections, faster production, better quality work.
- Feather-touch slag removal—cleaning time reduced to an absolute minimum.
- Deep penetration for root pass welds. Makes XL-610 especially suited to heavy plate fabrication, pipeline, shipyard, pressure vessel and construction work.
- Extremely low spatter loss, even with high currents. Higher deposition rates, easier cleaning.
- PLUS these exceptional "physicals". . .

J-21911

YOU CAN BE SURE...IF IT'S Westinghouse

ABS Specifications	Westinghouse XL-610		
	5/32"	3/16"	1/4"
Percent elongation in 2" . . 22%	28	28	34
Yield strength, psi 50,000	52,900	54,800	53,800
Ultimate strength, psi . . . 62,000	65,900	64,500	62,400

WESTINGHOUSE ELECTRIC CORPORATION
Welding Dept., Box 868
Pittsburgh 30, Pa.

Gentlemen: Please rush full information plus samples on new Westinghouse XL-610.

Name_____ Title_____

Company_____

Street & No._____

City_____ Zone_____ State_____

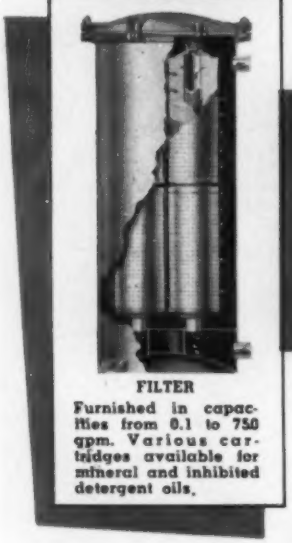
Clean Oil

SAVES YOU MONEY!

HILCO

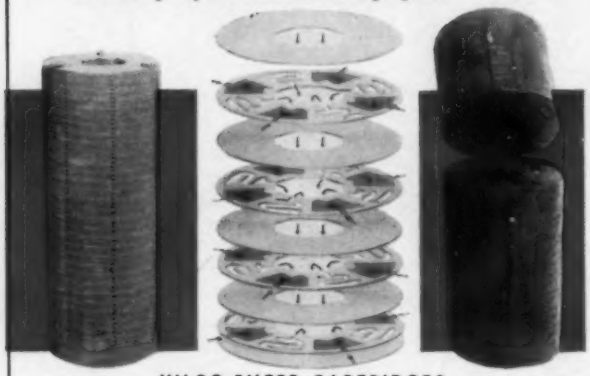
OIL MAINTENANCE EQUIPMENT

. . Keeps your Oil and Equipment Clean



FILTER

Furnished in capacities from 0.1 to 750 gpm. Various cartridges available for mineral and inhibited detergent oils.



HILCO FILTER CARTRIDGES

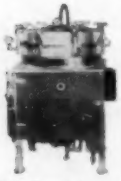
The result of much research in the field of lubricating, fuel and industrial oil filtration, the new patented HILCO Filter Cartridges meet the need for tremendous filtering area, low pressure drop and high dirt storage capacity. Above: Fig. 1 is a new cartridge; Fig. 2 is a used cartridge (note that pockets are completely filled and the outer surface covered with solids); Fig. 3 shows the flow of oil, the dark area represents dirty oil passing into the pockets while filtered oil (white area) passes into "S" shaped section.

HILCO Purification Means *Complete* Oil Purification . . .

You get absolute removal of sludge, acids, carbon, water and fuel dilution with a properly selected HILCO. Clean oil saves you money. Expensive maintenance is reduced, equipment shut-downs practically eliminated, lost man hours and cuts in production become a thing of the past. HILCO continuous, all electric, automatic purification keeps your oil clean and in top condition at all times. You receive the full capacity and economy of your equipment.

HILCO offers a wide range of oil purification units to meet every oil conditioning problem. HILCO units are manufactured in both stationary and portable models. Write us about your purification needs . . . recommendations are given with no obligation. Let HILCO put its 25 years of experience in oil purification to work for you.

THERE'S A HILCO FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM



Oil Reclaimer

Purifier Re-Refiner

High Capacity Reclaimer

WRITE TODAY FOR THE NEW HILCO CATALOG

• Recommendations at no obligation!!

THE HILLIARD Corporation

64 W. FOURTH ST. • ELMIRA, NEW YORK

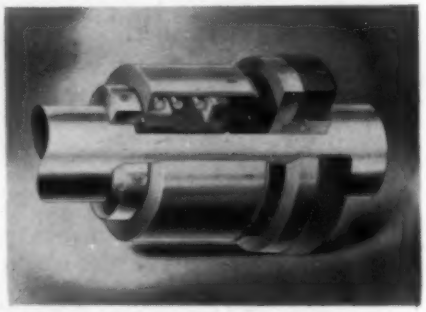
IN CANADA: Upton-Bradeen-James Ltd., 890 Yonge St., Toronto; 3464 Park Ave., Montreal

NEW EQUIPMENT . . .

Pipe Reforming Clamp

A new product, now being offered to the pipe line industry by Morris-Young-Owens Company of Houston, is the Myoco pipe reforming clamp. Designed so that pipe can be aligned to flanges and valves without wedging or hammering, the clamps are available in all sizes up to 72 inches in diameter.

For more data circle **No. E3** on Readers' Service Card, last page this issue.



Mechanical Seal

A mechanical seal, specifically designed for use on rotary shafts at pressures up to 150 psi, has been announced by The Garlock Packing Company. Known as the Garlock BB-21A Mechanipak Seal, it is furnished completely assembled, ready to install. Standard construction includes brass shell, brass washer and Buna-N bellows. Seals are available for shafts from 3/8-inch to 3-inch diameters.

Buna-N or neoprene bellows are furnished for operating temperatures up to 212° F. and pressures up to 150 psi. Silicone bellows are provided for temperatures up to 400° F. where pressures do not exceed 50 psi.

Use of these seals eliminates wear on shafts and shaft sleeves, eliminates fluid leakage, reduces downtime and cuts maintenance costs.

(This item supplements The Garlock Packing Company data on Page 1776 of the Composite Catalog, 20th Edition.)

For more data circle **No. E4** on Readers' Service Card, last page this issue.

DO *YOU* TAKE GASKETS FOR GRANTED?

In the costly processes of today's industry — where fluids are confined in searing heat and brutal pressures — taking a gasket for granted is serious business. The price of gasket failure is measured in damaged equipment, plant "down-time", danger to personnel.

No one at Flexitallic has ever taken a gasket for granted. Each Flexitallic Spiral-Wound Gasket is engineered to be the right gasket for the right flange for the right seal. For 43 years, Flexitallic has worked toward perfecting this principle. Small wonder more and more engineers are specifying on orders: "Flexitallic — do not substitute".

Each Flexitallic Gasket is designed and engineered to meet specific conditions of thermal and physical shock, corrosion, vibration, weaving and unpredictable joint stresses. Spirally-wound V-crimped plies of required metal with alternating plies of proper filler result in a resilient gasket having characteristics of a calibrated spring.

Flexitallic Gaskets are at highest efficiency when bolted up cold at a predetermined load. For all pressure/temperature ranges from vacuum to 10,000 lbs., from extreme sub-zero to 2000°F. For all standard joint assemblies. In four thicknesses for special requirements: .125", .175", .250", .285". In diameters to 84" O. D.

FLEXITALLIC GASKET CO.
8th & Bailey Sts., Camden 1, N. J.
Representatives in principal cities

Flexitallic®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Not all spiral-wound gaskets are Flexitallic. Look for *Flexitallic Blue* —it's our exclusive blue-dyed Canadian asbestos filler.

NEW EQUIPMENT . . .

Asbestos Sheet Packing

A new asbestos sheet packing has been announced by the Thermoid Company to handle gasket requirements of industrial plants. A gray-black color, it is suitable for handling steam, hot and cold water, brine, air and oil up to 300 psi and 500° F. Average tensile strength of cross-laminated material is 4500 psi and for homogenous packing 3000 psi. It analyzes 70 percent ash with a 2 percent water absorption.

It is made in three thicknesses—1/32-inch, 1/16-inch and 1/8-inch—and in three sheet sizes—48 inches by 48 inches (cross-laminated or homogenous), 48 inches by 72 inches (homogenous) and 48 inches by 144 inches (homogenous).

(This item supplements Thermoid Company data on Pages 4878-4879 of the Composite Catalog, 20th Edition.)

For more data circle **No. E5** on Readers' Service Card, last page this issue.

See Composite and Refinery Catalogs, or Write for Specifications Folder

FLEET-LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from 1/4" to 24"

ASTM A234

Also for pressure vessel heads

Special sizes and lengths. Schedules 10 to 160 Stainless Steel, and other Alloys.

Nominal pipe sizes 1" to 30"

ASA B16.9
ASTM A234

Immediate Delivery

STEEL FORGINGS, Inc.

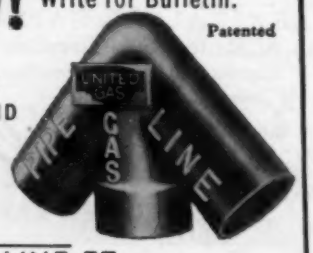
P. O. Box 276K • Shreveport, La.

Foot of Fannin Street

NEW! Write for Bulletin.

Patented

PIPELINE VENTS AND MARKERS

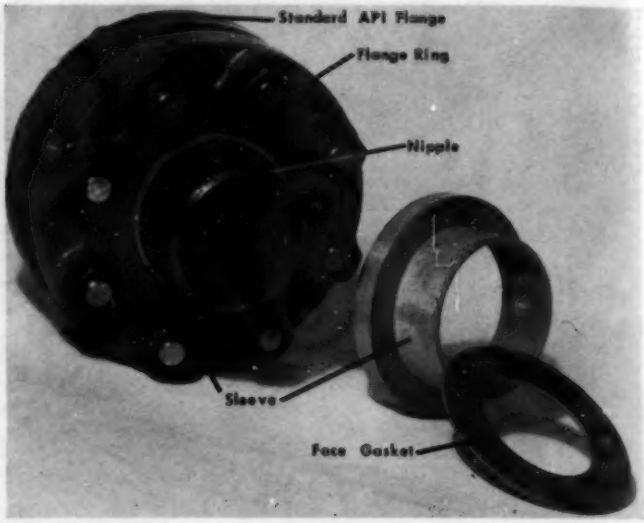


FLEET-LINE CO.

P. O. BOX 276K

SHREVEPORT, LOUISIANA

Insulated Flange



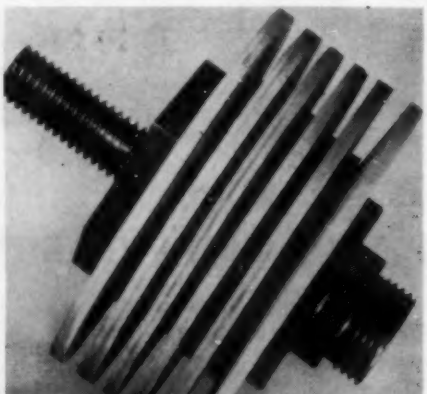
The Tudor insulated flange, product of Paramount Equipment Company, provides protection against flow of galvanic and stray electrical currents in flowlines through electrical isolation of the line sections. Protection is provided by an insulated joint which incorporates mechanical strength with the properties of Formica insulation.

An insulated flange assembly consists of a standard API forged steel flange plus a Tudor insulated flange of the welding neck, slip-on or threaded type. The two flanges are electrically isolated by a neoprene-faced phenolic gasket and insulating sleeve. Extension of the sleeve beyond the flange ring into the flange separation space and along the skirt of the nipple maintains the high degree of electrical isolation between the flanges even during adverse weather. Use of the neoprene face on the face gasket results in a superior reuseable seal between the flanges.

The insulation material in both the face gasket and the sleeve is a fabric-base, phoenoic laminate with a high degree of dimensional stability, mechanical strength and moisture resistance.

(This item supplements Paramount Equipment Company data on Page 4113 of the Composite Catalog, 20th Edition.)

For more data circle **No. E6** on Readers' Service Card, last page this issue.



Porous Filters

Porous Plastic Filter Company has released a new design in porous Teflon and Kel-F in-line filters. The porous fluorocarbon filters are of all welded construction with molded flow passages and are designed for easy disassembly and cleaning. Great compactness has been achieved with a square foot of filter area contained in a volume two inches high and 3½ inches OD. Sizes up to 10 square feet are available.

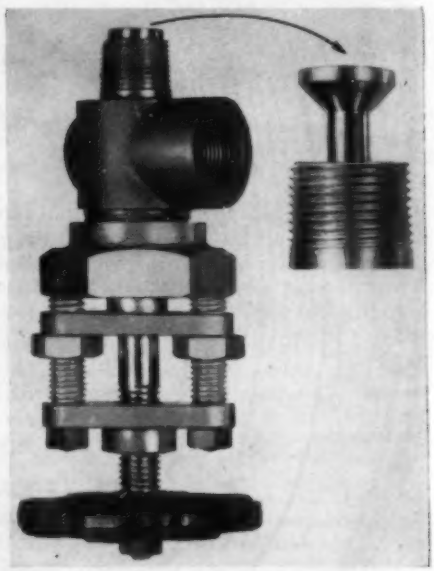
For more data circle **No. E7** on Readers' Service Card, last page this issue.

Drain or Sampling Valve

A new drain or sampling valve announced by Jerguson Gage & Valve Company is completely self-draining. With valve stem seats on the outside of the valve body, it is ideal for installations where desirable to have the valve seat inside the wall of a vessel to prevent liquid from remaining in the nipple and valve.

This new Jerguson valve has outside screw and yoke construction to meet high temperature or corrosive conditions where inside threads cannot be tolerated. The outside thread design eliminates possible freezing and allows the valve stem to work freely at all times. The stem is constructed with a left-hand thread

(This item supplements Jerguson Gage & Valve Company data on Page 2503 of the Composite Catalog, 20th Edition.)



For more data circle **No. E8** on Readers' Service Card, last page this issue.

Circle numbers on Readers' Service Cards on last page

On varied field applications like these . . .

Johns-Manville TRANTEX *polyvinyl* TAPE

gives lasting protection against pipeline corrosion!

ON JOB AFTER JOB, Johns-Manville Trantex Tape is controlling corrosion and extending the service life of underground gas and oil pipelines.

Trantex is a durable plastic tape that sticks on contact—bonds tightly to the pipeline. No heat or heavy duty equipment is needed in its application. It is easily applied by hand or by specially developed hand-operated machines. Many users have found that field-applied Trantex Tape speeds coating applications . . . lowers construction costs on both large diameter transmission lines and gas distribution systems.

Trantex Tape is a development of Johns-Manville—a pioneer in the manufacture of Asbestos Pipeline Felts. For further information about Trantex Tape, write for copy of PP-26A, Johns-Manville, Box 60, New York 16, N. Y.

	*V-10	**V-20
Dielectric Strength per mil thickness, Approx.	1,000 V	1,000 V
Insulation Resistance, greater than (ASTM-D-257-49)	100,000 megohms	100,000 megohms
Temperature Limit	200 F	200 F
Adhesion oz. per inch width	30	20
Tensile Strength lbs. per inch	30	56
Elongation at Break	250%	300%

"Trantex" is a black polyvinyl tape. It is available in two thicknesses—

*V-10 is a 10 mil tape for average conditions, and

**V-20 is a 20 mil thickness for use where a more rugged coating is specified, such as to repair enamel coatings.

JM PRODUCTS

Johns-Manville TRANTEX *polyvinyl* TAPE

PROTECTS PIPELINES AGAINST CORROSION

GOT A PARAFFIN PROBLEM?
Use
BrakeSol
HOLDS PARAFFIN IN SUSPENSION
from
FORMATION to REFINERY

SAVE ON COSTLY REMOVAL METHODS

BRAKESOL is ECONOMICAL, prevents or removes paraffin from the tubing, flow lines, tank bottoms and pipe lines. Effective on both asphalt and mixed base paraffin.

BRAKESOL is SAFE and easy to use. Your paraffin problems analyzed without obligation by our Sales Engineers. Contact your local supply store.

WRITE for FREE Descriptive Folder

BRAKESOL, Inc.
P.O. Box 9506 Okla. City, Okla.

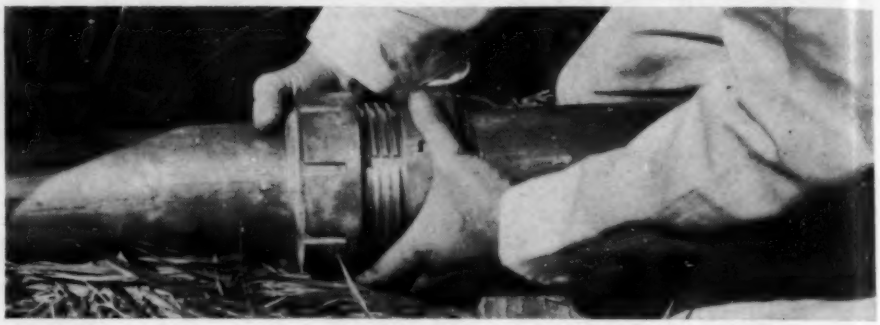
REPAIR LEAKS
QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.

SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A.

NEW EQUIPMENT . . .



Aluminum Pipe

A new aluminum line pipe that provides outstanding economy in installation cost and time is in production at Kaiser Aluminum & Chemical Corporation.

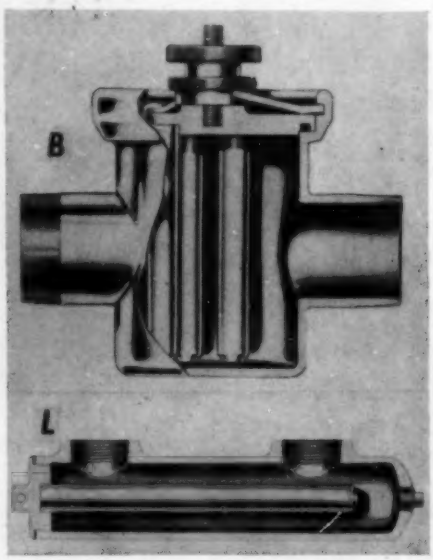
Employing quick-connecting, detachable couplers of new design, Kaiser aluminum petroleum pipe has been installed, and later taken up, by regular crews in one-sixth the time required for standard steel pipe.

Roll-formed and welded from high-strength aluminum sheet in 2, 3 and 4-inch diameter, the new pipe can be flanged at the ends by power machinery in shop or warehouse or by hand tools in the field for attachment of the cast aluminum couplers. No welding of couplers to the pipe is required.

Advantages include low initial cost, speed and ease of installation, lightweight giving portability, inherent corrosion resistance, simplicity of pipe lining and field adjustment, high strength, flexibility at joints and a smoother inside surface that minimizes friction and turbulence.

Hand pressure only is sufficient to make leakproof connections with the new pipe. The coupler shown is manufactured by Gateway Engineering Company, one of three firms making detachable couplers for the welded pipe. The couplers give high flexibility, easy installation and leakproof seals at pressures of from 0 to 1000 psi in both gas and liquid service.

For more data circle **No. E9** on Readers' Service Card, last page this issue.



Magnetic Traps

Production of a new line of permanent magnetic pipe line traps for removal of iron fines and tramp iron from liquid material has been announced by Eriez Manufacturing Company.

Called Ferrotraps, the units have a revolutionary design which affords 300 percent to 400 percent greater magnetic trapping area. Eriez is manufacturing the Ferrotraps in two models, to fit pipe lines from ½-inch to 4 inches, and in a range of materials, finishes and strengths specifically adapted to the requirements of a variety of operating conditions and problems.

Ferrotrap Model B, designed to afford the greatest protection, is made in stainless steel, in both highly polished sanitary models as well as machine finished standard models, and is available for 2-inch, 3-inch and 4-inch pipe lines. Ferrotrap Model L is specifically designed for less excavating work where a sturdy low-cost unit, primarily required for tramp iron separation, will provide adequate protection. Adaptable to pipe lines from ½-inch to 2 inches, Model L is made in bronze and contains one highly efficient, fully encased magnetic element.

Shown are cutaway views of both models.

For more data circle **No. E10** on Readers' Service Card, last page this issue.

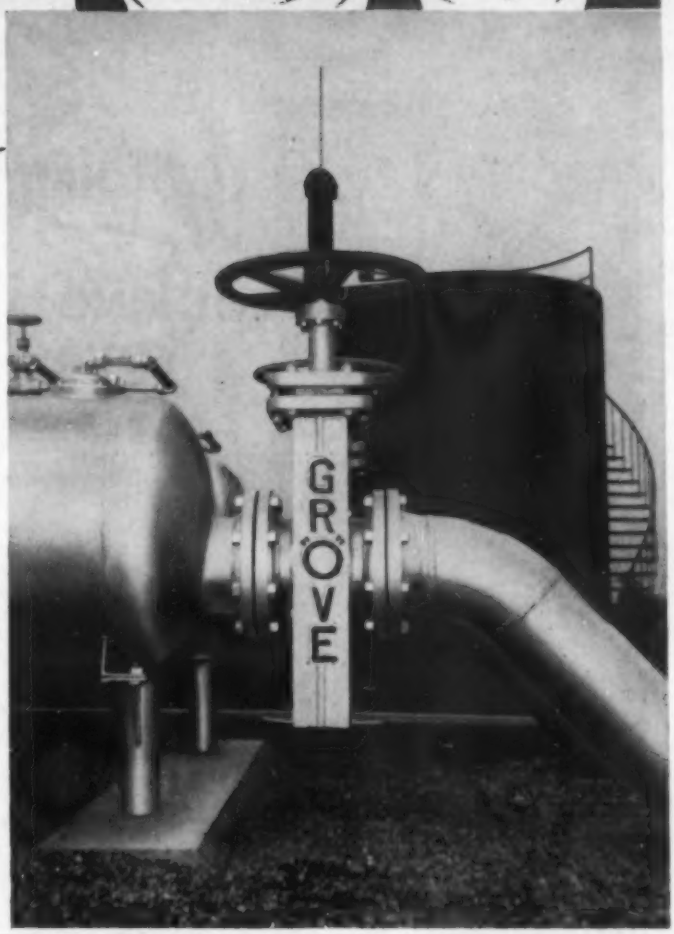
GUNITE COATINGS for PIPE LINES

Reinforced GUNITE COATING being applied to pipe.

Your inquiry solicited.

GUNITE CONCRETE & CONST. CO.
1301 WOODSWETHER RD., KANSAS CITY 5, MO
3206 HOUSTON, HOUSTON 9, TEX.
CHICAGO—ST. LOUIS—DENVER
MILWAUKEE & TWIN CITIES—NEW ORLEANS

THERE'S SOMETHING NEW ON THE LINE



wherever products, crude or gas are flowing, you'll continue to see more and more of these

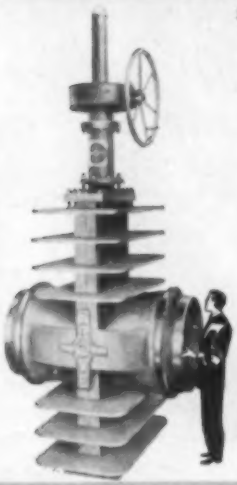
NEW GROVE SEAL-"O"-RING FABRICATED STEEL GATE VALVES

Opening a whole new realm of gas and petroleum pipe line applications, the Grove fabricated steel through-conduit valve body introduces a new concept of design flexibility, safety and dependability. Full opening or Venturi types are available with flanged or welding ends for 2" to 36" lines in ASA Series 150, 300, 400 and 600. For the full story on the valve of tomorrow – already proved in use today – contact your Grove representative, or phone, write or wire for details.

This is one of several carloads of new Grove Seal-"O"-Ring fabricated steel gate valves en route to a major gas pipeline.

Bubble-tight seal, with flow in either direction, plus freedom of operation of Grove Seal-"O"-Ring Valves is important on products line installations of this type.

505



GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • LOS ANGELES 6 — 1930 W. Olympic Blvd.

ODESSA, TEX. • TULSA, OKLA. • LAFAYETTE, LA. • CHICAGO, ILL. • DENVER, COLO. • In Western Canada: GROVE VALVE LIMITED

GROVE SEAL O RING GROVE SIMPLICITY ACCURACY SAFETY

Corrosion IS LOOKING YOUR WAY

PROTECT YOUR INVESTMENT WITH HARCO CATHODIC PROTECTION SYSTEMS

Night and day . . . around the calendar . . . corrosion is looking YOUR way . . . and it's a costly stare. It means the continuous destruction of metal structures that are in contact with the earth. It means loss of pipelines and storage tanks. It means you are failing to enjoy profits that are rightfully yours.

Now . . . Harco Engineers can stop the ravages of corrosion. They can show you how an inexpensive cathodic protection system will increase your profits . . . save you money.

Harco supplies a complete range of services. Whatever your needs . . . job engineered systems, contract installations or cathodic protection materials . . . specify HARCO, first in the field of cathodic protection.

Write today for catalog or call MOntrose 2-2080.

6249-HC

Harco

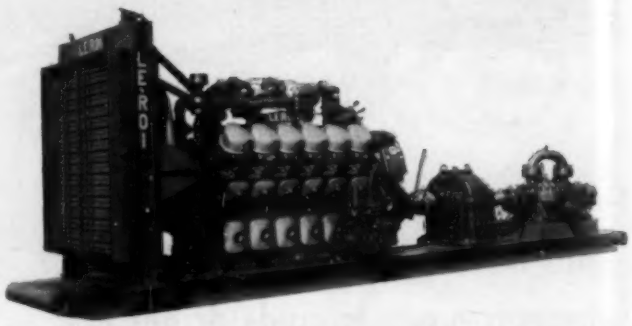
THE HARCO CORPORATION

17019 BROADWAY • CLEVELAND, OHIO

CATHODIC PROTECTION DIVISION

CLEVELAND • ALBANY • ATLANTA • CHICAGO • DAVENPORT • DETROIT • HOUSTON • LOS ANGELES • LOUISVILLE • STRASBURG
MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PITTSBURGH • PHILADELPHIA • SALT LAKE CITY • SEATTLE • ST. LOUIS • TORONTO, Canada

Powerful LeRoi-Goulds Pumping Unit for forming underground storage.



Unitized by Southern Engine & Pump Company for a natural gasoline company to these specifications:

ENGINE: LeRoi Model L-3460 Natural Gas Engine 7¼ x 7

PUMP: Goulds Figure 3360 Size 3" 6-stage equipped with Crane Mechanical Seal

BASE: 44" x 26' consisting of 10" main members

DUTY: 450 GPM—700 PSI—Fresh Water 900 RPM Engine Speed—3600 RPM Pump Speed

Such a unit is typical of many done by us during 47 years of service to industry. Skilled mechanics and competent engineers are available to serve your special needs.

DISTRIBUTOR

SOUTHERN ENGINE & PUMP COMPANY

MANUFACTURERS • MACHINERY FACTORS • CONTRACTORS

Houston — Dallas — Kilgore — San Antonio — Edinburg — Corpus Christi and Beaumont, Texas — Lafayette and New Orleans, La.

STANDARD OF THE INDUSTRY . . . for cutting steel or cast iron pipe . . .

THE

ALSTON *Rachet* PIPE CUTTER

There's none better for SPEED, SAFETY, POWER, ACCURACY and ECONOMY. It eliminates dangerous sparks . . . broken cutters; rollers hold pipe taut after cutting. It's easy on and off pipe . . . will cut 10" pipe in 12 min. Patented roller guides. Rachet makes it easy to work in close places.

A size for every requirement . . . write for details, literature and prices.

ALSTON MANUFACTURING COMPANY

P. O. Box 707 Phone 226

LIVINGSTON, TEXAS

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Compressor Data

Feather valve compressors from 75 to 350 horsepower are the subject of a new bulletin published by Worthington Corporation. Fourteen advantages on installation, operation and maintenance costs are outlined for types YC and DYC compressors. Information and illustrations are included on component parts including frame, running gear parts, intercooler, crosshead, motor and main bearings. Various full-page cutaway views are included.

Five-step and three-step variable capacity control information is listed along with data on governors.

A two-page diagram illustrates correct selection and coordination of all auxiliary equipment used in typical installations, and various photographs show actual compressor installations. Compressor accessories are listed along with a chart outlining types, piston displacement, size, rpm and horsepower.

To get a copy circle **No. E11** on Readers' Service Card, last page this issue.

Laminated Pipe Booklet

A new bulletin on its line of laminated fluorocarbon resin pipe has been released by Resistoflex Corporation. The bulletin describes physical and chemical properties of the Fluoroflex-T Laminated pipe. Other data include piping specifications, detailed description of flanging and coupling Fluoroflex-T pipe in the field with a special tool, as well as suggested applications for the chemically-inert plastic pipe.

The latest price price list also has been inserted in the new bulletin.

To get a copy circle **No. E12** on Readers' Service Card, last page this issue.

New Service Brochure

Corrosion Rectifying Company presents complete data about the company, its services and equipment in an illustrated introductory folder. Application of the available services and facts about the company's organization are included.

To get a copy circle **No. E13** on Readers' Service Card, last page this issue.

Pipe Line Protection

A new illustrated booklet describing applications and giving property data on "Scotch" brand products for pipe line protection has been announced by Minnesota Mining and Manufacturing Company.

The booklet covers use of Scotchrap brand all-weather pipe wrap tapes, pipe primer and Scotch brand filament which is used for attaching rock shields to buried pipe. In addition it covers Scotchfil electrical insulation putty, Scotch plastic tape and Scotchkote electrical coating for use in protection of splices in anode ground bed installations where resistance to moisture, fungus and mechanical abrasion is required.

Charts showing complete physical and electrical insulating properties for each of the products are included and a wide range of typical pipe line applications are pictured.

To get a copy circle **No. E14** on Readers' Service Card, last page this issue.

Tractor Folder

The new Euclid TC-12 twin crawler tractor, powered by two 194-horsepower diesels, is described in a catalog recently released by Euclid division of General Motors Corporation.

Described is the new design of the tractor with its two engines and separate torqmatic drives for each track that gives it a total of 365-horsepower delivered to the power train. Other features illustrated are rear radiator mountings, separate and independent track drives and hydraulic track tension.

To get a copy circle **No. E15** on Readers' Service Card, last page this issue.

Regulator Controls

Versatility and flexibility of its line of high and low pressure balanced valve regulators are outlined in a new bulletin, "Special Controls," published by Rockwell Manufacturing Company.

Consideration of specific regulator problems and solutions are presented by use of full pages of text together with a facing page of cross-sectional schematic drawings to each of 16 distinct gas regulation situations in which special controls are necessary.

To get a copy circle **No. E16** on Readers' Service Card, last page this issue.

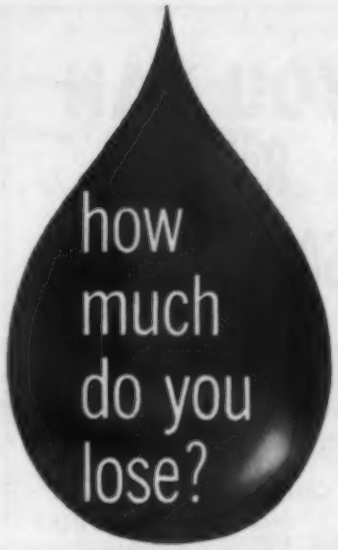
Tone Signaling Units

A new brochure has been published by Hammarlund Manufacturing Company, Inc., describing operating features and performance of new supervisory tone equipment of modular design.

These audio tone signaling units make up a line of equipment which is built to fulfill the concept of Centralized Operations Control, the complete controlling and metering of any number of remote functions from master control centers to achieve efficiency, speed and economy.

The brochure describes how these units transmit and receive signaling, dialing, telemetering, supervisory controls and other information over wire lines, telephone or power line carrier and radio microwave communication circuit.

To get a copy circle **No. E17** on Readers' Service Card, last page this issue.



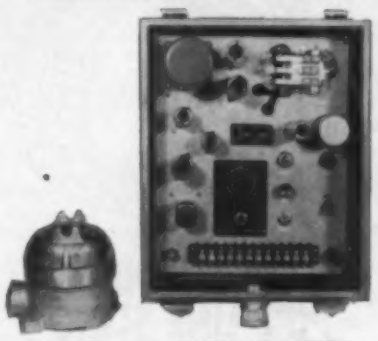
DUE TO INEFFICIENT PIPELINE PATROL?

With 11 years experience — during which we've flown over 8,000,000 miles, we can give you a more efficient and dependable pipe line patrol at less expense.

WRITE TODAY! For FREE, 16 page color booklet describing our services in detail.

gleason romans
PIPE LINE PATROL CO.
P O BOX 8447 • TULSA, OKLAHOMA
PLANE LOCATIONS: TULSA — HOUSTON, MIDLAND, RANGER, SULPHUR SPRINGS, TEX. — LAFAYETTE, LA. LAUREL, MISS. — LIMA, OHIO

VIBRATION PROTECTION



MODEL 4A VIBRASWITCH

The Model 4A Vibraswitch is designed to protect large motors, centrifuges, pumps, turbines and other heavy equipment against damage in the event of excessive vibration. Many control features available to meet specific applications.

Write today for details pertaining to your requirements.

Representative's inquiries invited for open territories.

THE BETA Corporation
RICHMOND, VIRGINIA
FOREST AVENUE AND RIDGE ROAD
Telephone 88-3153

YOU CAN
Rely on
SAND-BANUM

Pure Colloidal Concentrate to Safely and Surely Remove and Prevent Boiler Scale and Corrosion.

USE OUNCES ONLY ONCE A WEEK!

Get more power from less fuel and fewer shut-downs.

STOCKED BY LEADING SUPPLY HOUSES

Gulf Coast District Representatives
WESTERN SAND-BANUM CO.
705 M & M Bldg., Houston 2, Texas

AMERICAN SAND-BANUM CO., Inc.

Established 1926

Meadow Brook National Bank Bldg.
FREEPORT, NEW YORK

The First Completely

SAFETY-ENGINEERED PIPE LINE SLING

GREENHEAD SLINGS have approximately 100,000 lbs. more strength than ordinary slings. GREENHEAD SLINGS give you lower cost, greater durability, lighter to handle, easily operated by one man.

- 10 ply belting covers ropes on pull-out side
- No stretch to tear pipe wrapping
- Cable Protector saves wire ropes
- Tough, cast, bearing-plates
- 4-9/16" wire ropes in basket hitch, 222,400 lbs. ultimate strength
- Completely eliminates the old ball and pins

Write us about your special sling requirements

GREENHEAD SLING AND SUPPLY COMPANY
3912 Leeland Houston, Texas

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 20th (1953-1954) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

A

• Allis-Chalmers Manufacturing Co. 22-23
Alston Manufacturing Co. 122c
• American Recording Chart Co. 110
• American Sand-Banum Co. 124a
American Telephone & Telegraph Co. 61
Armco Steel Corp. 53

B

The Beta Corp. 123b
• Bethlehem Steel Co. 81
• Bethlehem Supply Co. 2
Bonney Forge & Tool Works 16
Brakesol, Inc. 120a
The Ralph N. Brodie Co. 13
• Bucyrus-Erie Co. 83

C

Caterpillar Tractor Co. 9
• Clark Bros. Co. 18-19
The Cleveland Trencher Co. 90a
Coast Paint & Lacquer Co. 64
• Crane Co. 12
• M. J. Crose Manufacturing Co. 93

D

Dallas Manufacturing & Sales Co. 102b
Darling Valve & Manufacturing Co. 7
De Laval Steam Turbine Co. 85
Delta Engineering Sales Co. 102a
• Dollinger Corp. 91
• Durametallic Corp. 86a

E

Eastman Chemical Products, Inc. 25
The Electric Controller & Mfg. Co. 89
Electro Rust-Proofing Corp. 98
• Emsco Manufacturing Co. 84

F

• Fisher Governor Co. 10-11
Fleet-Line Co. 118b
• Flexitallic Gasket Co. 117
• Fram Corp. 17

G

• Gaso Pump & Burner Mfg. Co. 128
Gilbert & Barker Manufacturing Co. 79
• H. P. Gott Mfg. Co. 90b
• Graver Tank & Mfg. Co. 8
Greenhead Sling & Supply Co. 124b
The Griscom-Russell Co. 57
• Grove Valve & Regulator Co. 121
Gulf Oil Corp. 88
• The Gulf Publishing Co. 86b
Gunite Concrete & Construction Co. 120c

H

Hammond Iron Works 55
Harco Corp. 122a
• Hercules Motors Corp. 82
The Hilliard Corp. 116

I

• Ingersoll-Rand 109

J

• Johns-Manville 119

K

Kaiser Steel Corp. 111
Kewanee-Ross Corp. 107
• Kinzbach Tool Co. 80

L

Ladish Company ..... 35, 69 and 87
Layne & Bowler Pump Co. 6
• Leschen Wire Rope Division H. K. Porter Co. 78
• Warner Lewis Co. 17
• Lowell Wrench Co. 96
• Lufkin Foundry & Machine Co. 105

M

• The Mercoid Corp. 76
• Mixing Equipment Co. 103
Monsanto Chemical Co. 101
Morris-Young-Owens Co. 77

N

National Tube Division United States Steel Corp. 112-113
Newport Steel Corp. 20

O

• Oil Well Supply Division United States Steel Corp. 5

P

Tod Pazdral Pipeline Specialties 100
• Pelican Supply Co. 124c
• Perrault Equipment Co. 104
Pipe Line Anode Corp. 74
Pittsburgh Coke & Chemical Co. 63
• H. K. Porter Co. 78
Pye Telecommunications Ltd. 70

R

The Ridge Tool Co. 24
• Rockwell Manufacturing Co. 58-59
Gleason Romans Pipe Line Patrol 123a

S

The H. M. Sawyer & Son Co. 73
Sealol Corp. 65
Shand & Jurs Co. 14-15
• M. B. Skinner Co. 120b
Southern Engine & Pump Co. 122b
• Steel Forgings, Inc. 118a

T

• Thornhill-Craver Co. 97
• Tretolite Co. 127
Tube-Turns, Inc. 21

U

• United States Steel Corp. 5

W

• W-K-M Manufacturing Co. 67
Walworth Co. 95
Westinghouse Electric Corp. 115
Williams Brothers 94a
• T. D. Williamson, Inc. 108
• Wisconsin Motor Corp. 106
• Worthington Corp. 36

Y

The Youngstown Sheet & Tube Co. 99

Z

H. B. Zachry Co. 94b

NOTICE: Specify **PELCO** Welding Saddles

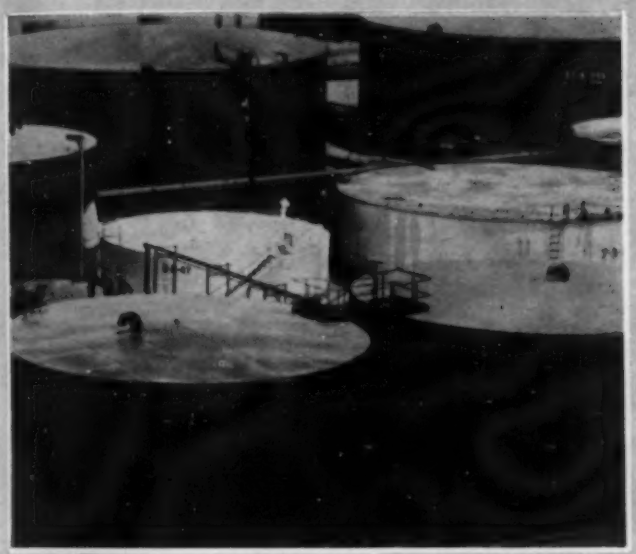
No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

PELICAN SUPPLY CO. INC.

P. O. Drawer 1108 Shreveport (84), La.
SEE YOUR NEAREST SUPPLY HOUSE

HELPFUL SERVICES *for* PIPELINERS

Most pipeline men know that very little crude oil is shipped through lines unless it passes specifications for BS and W. Experienced pipeliners also know that the majority of producers everywhere use Tret-O-lite demulsifiers to insure that their crudes do meet pipeline specifications.



Tret-O-LitE

TRET-O-LITE DEMULSIFIERS
for eliminating tank bottoms

KONTOL

KONTOL CORROSION INHIBITORS
for preventing corrosion and cleaning lines

The Tretolite Company also offers products and services designed to alleviate many of the problems encountered in transporting oil through pipelines. If you don't have complete information on how these products can help you, get in touch with your nearest Tretolite service engineer or write to

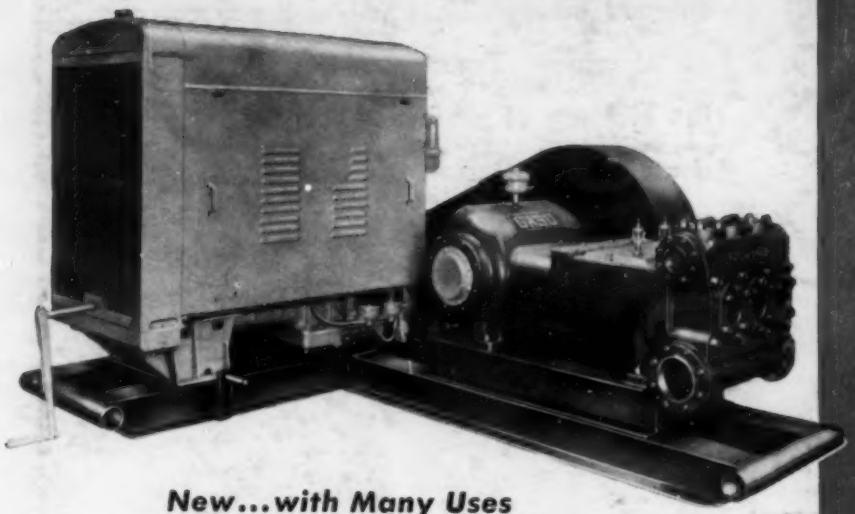
TRETOLITE COMPANY
A DIVISION OF PETROLITE CORPORATION
369 Marshall Avenue, St. Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

KPL 55-11

KONTOL

KONTOL SPECIAL CORROSION INHIBITORS ***for preventing rust and corrosion in product lines***

PUMPS FOR EVERY OIL INDUSTRY NEED



New...with Many Uses

GASO SERIES 3600

Type

Horizontal Triplex Plunger Pumps with 6" stroke, available with either of two fluid ends. Large capacity fluid end (Fig. 3671) takes plungers with diameters of 2½" to 3½", and operates with pressures from 1575 to 800 psi. Small fluid end (Fig. 3670) takes plunger with diameters of 1¼" to 2¼" and operates with pressures from 6250 to 1935 psi. See chart at right for displacement capacities at various speeds.

Typical Uses

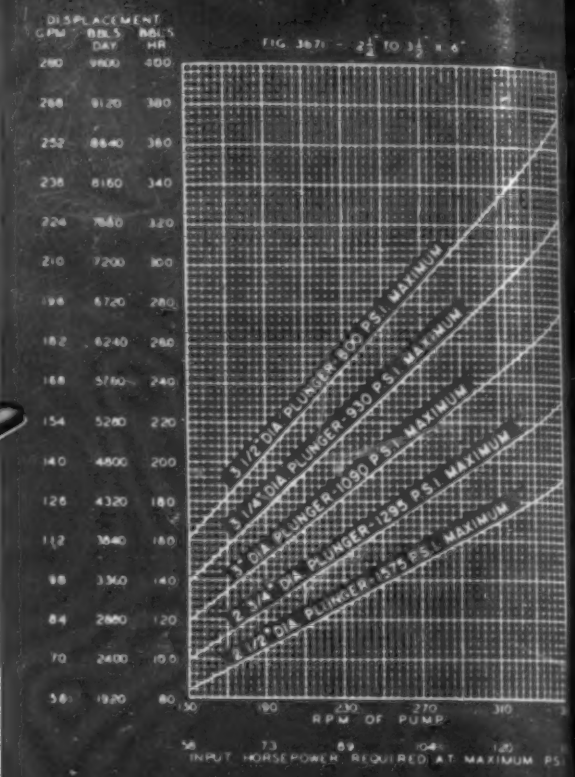
Water flooding, salt water disposal, power oil pumping, oil well acidizing, crude oil gathering systems, underground storage, cementing service, formation fracturing. Either fluid end can be supplied in the material best suited for the required service.

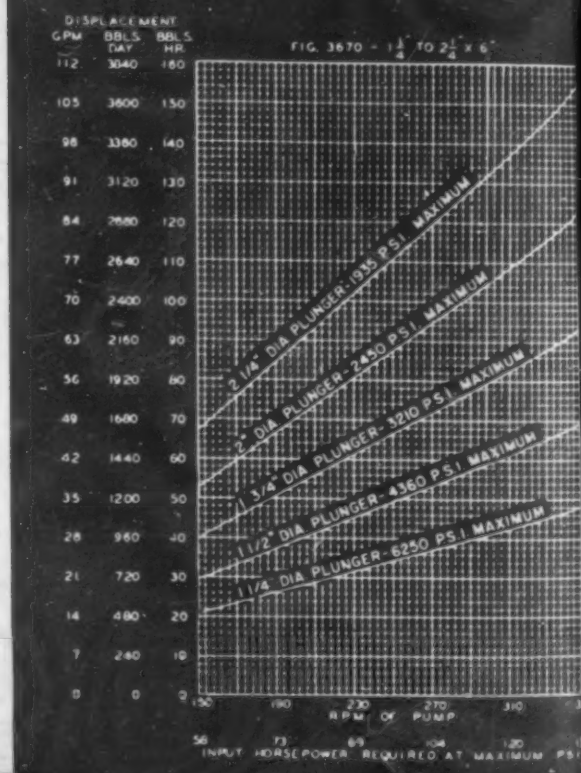
Design Features

Gaso simplicity throughout, with fewer parts made extra strong to minimize operator's worries and prolong pump life. Overhaul, when required, is a simple job.

Write today for special Bulletin on the Gaso 3600 Series

CAPACITY, PRESSURE AND POWER CURVES





GASO PUMPS

for every oil industry need

GASO PUMP & BURNER MFG. CO.
TULSA, OKLAHOMA
EXPORT OFFICE: 149 Broadway, New York, N. Y.

DISTRIBUTORS

W. L. SOMNER COMPANY, Shreveport, Louisiana
New Orleans, Louisiana • Odessa, Texas
Tinsley, Mississippi • Brookhaven, Mississippi

POWER PUMPS, INC., Long Beach, California
PEDDLERS, INC., Houston, Texas
LUFKIN MACHINE CO., Ltd., Edmonton, Alberta

NORTEX ENGINE & EQUIPMENT CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming